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Seminars

FINANCING ENERGY DEVELOPMENT

BEFORE THE

TASK FORCE ON ENERGY

OF THE

COMMITTEE ON THE BUDGET
UNITED STATES SENATE

July 26, 1976—FEDERAL FINANCIAL INCENTIVES THEIR ECONOMIC AND FISCAL IMPACT

July 27, 1976—BUDGETARY IMPLICATIONS

AUGUST 30, 1976

Printed for the use of the Committee on the Budget

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LETTER OF TRANSMITTAL

U.S. Senate,
Task Force on Energy,
Committee on the Budget,
Washington, D.C., August 30, 1976.

Hon. Edmund S. Muskie,
Chairman, Committee on the Budget,
U.S. Senate.

Dear Senator Muskie: Attached is the record of hearings the Energy Task Force conducted on July 26 and 27, 1976, on "Federal Financial Incentives for Energy Development". As you know, last summer the Senate Budget Committee's Energy Task Force made recommendations on oil and gas pricing that helped lead to the compromise energy legislation enacted last December. This summer, Congress is considering a different kind of energy legislation—bills designed to assist in financing energy production and developing new energy technologies. Key bills concern uranium enrichment and synthetic fuels.

A major feature of the Administration's energy proposals, aforementioned, involves various types of Federal financing guarantees designed to help private ventures borrow in capital markets by sharing with the private sector the risk of project failure. Such arrangements form contingent liabilities for the Government and may require considerable future expenditures of Federal funds. Thus, it is essential that Congress understand the financial commitments that will be required to accomplish such proposals if they are approved. In reviewing such proposals Congress should also consider energy's role in our national priorities. We must continue to be concerned about the size of the Federal budget. However, because of the importance of energy to our economy and the Nation's future we cannot afford to be pennnywise and pound foolish.

The fiscal and budgetary implications of the President's fiscal 1977 energy proposals deserve careful consideration. The President's off-budget funding proposals for energy far exceed his on-budget proposals for 1977. The First Budget Resolution recommended by the Committee and approved by the Congress in May accorded a high priority to on-budget energy proposals with the understanding that the off-budget proposals would be reviewed before the Second Budget Resolution. With this in mind and drawing on information gained from our hearings earlier this year, the Energy Task Force held further hearings on July 26 and 27. The hearings were designed to develop a better understanding of the use, as well as the financial and budgetary implications of various Federal financing options related to the Administration's fiscal 1977 energy proposals which are now before the Congress.

To explore these and related matters, the Energy Task Force had the assistance of a distinguished group of witnesses as indicated in the attached report. In light of the information adduced by these seminars, I asked the Energy Task Force staff, assisted by the CBO, to undertake a more detailed study of the pertinent matters. The information contained herein, together with the Staff Report, will provide a basis for the Budget Committee's actions in developing the Second Concurrent Resolution which the Congress must adopt in September.

Sincerely,

Frank E. Moss, *Chairman.*

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USE OF FEDERAL FINANCIAL INCENTIVES FOR ENERGY DEVELOPMENT

MONDAY, JULY 26, 1976

U.S. SENATE,
TASK FORCE ON ENERGY,
COMMITTEE ON THE BUDGET,
Washington, D.C.

The task force met at 9:40 a.m., pursuant to notice, in room 357, Russell Senate Office Building, Hon. Frank E. Moss (chairman of the task force) presiding.

Present: Senators Moss, Biden, Bellmon, McClure, and Domenici.

Staff members present: Lewis J. Ashley, task force coordinator. Full committee: Arnold Packer, chief economist; Heather Ross, senior economist; and Terence Finn, Dan Twomey, and Charles McQuillen, counsels.

Senator MOSS. The hearing will come to order.

OPENING STATEMENT OF SENATOR MOSS

This is the first of two seminars on the use of Federal financial incentives for energy development. Our primary objective is to develop a better understanding of the use and the economic and budgetary implications of various Federal financing options related to the administration's fiscal year 1977 energy proposals which are before Congress.

Energy is the lifeblood of our economy. And the future of this Nation is largely dependent upon the policies Congress adopts regarding energy. To reach our national energy goals it is clear that the United States must act to increase its domestic energy supplies and to reduce its vulnerability to embargo.

Last summer the Energy Task Force made recommendations on oil and gas pricing that helped lead to the compromise energy legislation enacted last December and to the pending natural gas bill. The task force report rejected instant decontrol and recommended measures which would provide an adjustment period during which the price of oil and natural gas in the United States could make a gradual, orderly transition. Enactment of the Energy Policy and Conservation Act last December was an important step toward our energy goals but others are required.

MAJOR ENERGY POLICY QUESTIONS FACING CONGRESS

This summer Congress is considering a different kind of energy legislation—bills designed to assist in financing energy production and developing new energy technologies. Two major energy policy questions facing the Congress are: (1) the extent to which such new energy technologies and new uses of fossil fuels should be developed, and (2) how these high risk and capital intensive programs should be financed.

The first concurrent budget resolution approved by Congress in April accorded a high priority to the on-budget energy proposals. However, the President's request for off-budget funding far exceeded his on-budget proposals.

The Budget Committee did not have adequate information on the proper mix of new technologies or the level of funding needed for such a mix at the time of the April budget resolution. Thus, the resolution provided funds for on-budget activities with the understanding that off-budget issues and specific program proposals would be reviewed in light of the budget resolution and later information. That time has now arrived.

USE OF FEDERAL FINANCIAL INCENTIVES—IMPLICATIONS

Today's hearing will focus on two main areas: (1) the appropriateness of using various Federal financial incentives—for example, loan or price guarantees, cooperative agreements—to achieve energy development goals, and (2) what are the economic and fiscal implications of these various forms of risk sharing.

Also of concern to the task force are: What are the relative advantages of the various financing options? Which ones provide the most beneficial energy response? What types of contingent liabilities best encourage the flow of private capital into private energy development ventures? How much will they add to the pool of available energy funds and what is their affect on capital markets?

In my own State of Utah all of these questions are presently being debated. Utah has enormous reserves of oil shale, tar sands, uranium, geothermal steam and coal which is suitable for liquefaction or gasification. However, development of the new technologies required to utilize these resources can't be handled completely by private capital markets. Such development will depend on some form of Federal incentive. Other States have had similar experiences.

FEDERAL ROLE IN ENERGY

Historically, the Federal role in energy has been to support basic nonnuclear research and technology. In the nuclear area the Government's role has been much more extensive and included production of nuclear technology and material.

In view of the growing U.S. reliance on foreign energy supplies, a decision must be made soon concerning the Federal role and the size of the effort to develop new technologies and whether to support them as nuclear power has been supported.

To assist us in considering these and other pertinent questions, we are pleased to have four distinguished witnesses join us today. They are: Mr. Barry Bosworth, senior fellow at the Brookings Institution; Mr. Stanley J. Lewand, vice president of Chase Manhattan Bank; Mr. J. Frank Cannon, director of sales and marketing and coal gasification, Koppers Co.; Mr. Charles S. Arledge, president of Garrett Nuclear Corp. We welcome you gentlemen.

In keeping with our informal seminar format, we have asked the participants to limit their opening statements to about 5 minutes. This will enable us to move quickly to our questions and maximize the exchange of information.

I want first to ask if my colleague from Idaho has any opening remarks he would like to make?

Senator McClure. No. I am anxious to see what the witnesses have to say. We will get into that discussion.

Senator Moss. Very good.

I will ask Miss Ross, a member of our staff, to make some brief comments to assist in setting the stage this morning.

STATEMENT OF HEATHER ROSS, SENIOR ECONOMIST, COMMITTEE STAFF

Ms. Ross. Thank you, Senator. I have some material here which I will be referring to and which I believe you already have a copy of.

[The information follows:]

Use of Federal Financial Incentives for Energy Development

INCREASING USE OF GOVERNMENT GUARANTEES FOR ENERGY FINANCING

Purpose of guarantees.—Induce the flow of capital to activities which would not otherwise have attracted funds, or would have faced less favorable borrowing terms, by sharing the risk of failure with private investors.

Role in energy area.—Induce private producers to produce more and consumers to consume less than they otherwise would, so that dependence on unreliable imported oil is reduced.

Types of risks.—Market risks; technology risks; and regulatory risks.

Types of guarantees

Traditional.—Market imperfection—e.g., overvaluation of risk, many small borrowers representing independent risks; actuarially sound government insurance program—fees from borrowers covering losses; classic example: FHA, 1934.

New.—Less emphasis on imperfect financial market; one or a few large borrowers; elements of common risk; example: uranium enrichment, synthetic fuels.

Relevance to budget process.—Impact on capital markets and economic activity; potential for sizable federal outlays; tendency for program distortion due to budget status.

LEGISLATION WHICH HAS RECENTLY PASSED THE SENATE

(1) Loan guarantees for private investments in energy conservation.

Amount of guarantees.—Fiscal year 1977: $2 billion. Fiscal year 1978: $2 billion.

Amount of budget authority.—Fiscal year 1977: 0. Fiscal year 1978: $60 million.

Originally $10 billion in guarantees as part of S. 3424, the energy conservation bill, scaled down and appended with other provisions of S. 3424 to the 15-month FEA extension, H.R. 12169).

(2) Loan guarantees for production of synthetic fuel from urban waste.

Amount of guarantees.—$900 million.

Amount of budget authority.—0.

Part of ERDA authorization bill (S. 3105), also a component of the synthetic fuels bill (H.R. 12112, S. 2896).

(3) Loan guarantees to accelerate development of geothermal resources.

Amount of guarantees.—$200 million.

Amount of budget authority.—$30 million.

Part of public works appropriation bill (H.R. 14236).

LEGISLATION PENDING IN THE SENATE

(1) Cooperative agreements guaranteeing private uranium enrichment ventures.

Amount of guarantees.—$8 billion.

Amout of budget authority.—0.

Proposed as Nuclear Fuel Assurance Act of 1976 (S. 2035).

(2) Loan guarantees for production of synthetic fuels.

Amount of guarantees.—Fiscal year 1977: $2 billion. Fiscal year 1978: $2 billion.

Amount of budget authority.—Fiscal year 1977: $500 million. Fiscal year 1978: $500 million.

Proposed in House Science and Technology Committee version of H.R. 12112. Senate bill (S. 2896) has $6 billion in guarantees, $1.5 billion in BA for FY 1977. Two other House committees have reported H.R. 12112 partially substituting price guarantees for loan guarantees.

Synthetic Fuels Bill (H.R. 12112)

I. HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY (REPORTED MAY 15, 1976)

Amount.—$4 billion in loan guarantees.

Eligible activities.—Low-, medium-, and high-Btu gasification, oil shale, biomass and other synthetic fuel plants. Renewable resource plants. Energy efficient industrial equipment and facilities.

Limitations.—No guarantee for full-scale oil shale plant until modular plant completed. Maximum 50 percent of guarantees for high-Btu gasification. Maximum 30 percent for other fossil-based synthetic fuels. Maximum 50 percent for biomass, renewable resources, and industrial energy conservation. Appropriate action required before guarantees made.

Terms.—Guarantee 75 percent of cost of project, possibly 90 percent to start. Up to 75 percent cost sharing grants for modular oil shale plants. Maximum maturity equals 30 years. Fees to cover administrative costs and probable losses not to exceed 1 percent of debt outstanding; enter revolving fund. Loans limited to U.S. citizens and firms, with ERDA waiver. Title to inventions vests in U.S., but may be waived.

Other.—Impact assistance up to $300 million, administered by ERDA. 90 day review by Congress of all guarantees and disapproval by concurrent resolution of projects costing over $200 million. Competitive impact review by Justice and FTC. with ERDA override. Governor's review and veto of plant location, with ERDA override subject to judicial review. State, community or tribal bonds for local impacts Federally taxable but interest differential subsidy provided.

II. HOUSE COMMITTEE ON BANKING, CURRENCY AND HOUSING (REPORTING JUNE 18, 1976)

Amount.—$3.5 billion in loan guarantees. $500 million in price guarantees. May trade off more price guarantees for fewer loan guarantees.

Eligible activities.—Same as Science Committee.

Terms.—Guarantee 75 percent of cost of project, overruns up to 60 percent. Maximum maturity equals 20 years. After minimum of 10 years, ERDA may consider termination of guarantee with 2–3 year notice. Minimum fees equals 1 percent, entered into revolving fund. Price guarantees operable after September 1977; available for life of facility. Provisions governing loan guarantees apply also to facilities receiving price guarantees to extent ERDA prescribes. Otherwise same as Science Committee.

III. HOUSE WAYS AND MEANS COMMITTEE (REPORTED JUNE 21, 1976)

Amount.—$4 billion in loan guarantees.

Eligible activities.—Same as Science Committee.

Limitations.—Same as Science Committee.

Terms.—Same as Science Committee.

Other.—Federal taxability of guaranteed state-local bonds, without interest differential subsidy. Deleted Science Committee provision authorizing Secretary of Treasury to use proceeds of public debt transactions to purchase obligations issued by ERDA Administrator. Otherwise same as Science Committee.

IV. HOUSE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE (REPORTED JUNE 25, 1976)

Amount.—$2 billion in loan guarantees. $500 million in price guarantees.

Eligible activities

Loan guarantees.—Synthetic fuel production from biomass, oil shale, and other domestic resources (excluding coal). Energy production from renewable resources. Demonstrations of energy efficient industrial equipment. Geothermal resource development.

Price guarantees.—Price guarantee agreements for nonregulated synthetic gas from coal or other hydrocarbons (but not from oil, natural gas, or their products). Contracts for purchase of synthetic gas and liquids from other than oil shale.

Limitations.—Loan guarantees for oil shale must be for modular facility (6,000–10,000 bbls/day). Appropriation action required before guarantees made. Price guarantees limited to 125,000 bbls/day of crude oil equivalent. Projects may not simultaneously receive price/purchase guarantees and loan guarantees.

Terms.—Guarantee price of purchase price may not exceed the price of imported oil at the time the guarantee agreement or purchase contract is entered into. Loan guarantees may not exceed 75 percent of program cost; 60 percent of any overrun. Maximum maturity of guaranteed loan—20 years. Minimum fees equals 1 percent of debt outstanding; entered in revolving fund. Maximum term of price guarantee agreements and purchase contracts equals 20 years—nonrenewable.

Other.—Industrial or other large natural gas users may contract with FPC-certificated synthetic gas producers and interstate pipelines for an uninterruptable supply of high Btu gas at whatever terms the parties agree on. Competitive impact review by Justice and FPC with no override. Governor's review and veto of plant location, with ERDA override subject to judicial review. Impact assistance up to $300 million, administered by ERDA. 90 day review by Congress of all loan guarantees, and disapproval by either House of projects costing over $100 million. State-local bond taxability with interest differential subsidy.

URANIUM ENRICHMENT BILL (S. 2035)

JOINT COMMITTEE ON ATOMIC ENERGY (REPORTED MAY 14, 1976)

Amount.—$8 billion in contractual authority: $1.4 billion—domestic share of 1 diffusion project; $3 billion—domestic share of 3 centrifuge projects; $3.6 billion—contingency for uncertainty of foreign participation and inflation; and $255 million for expansion of existing public facility at Portsmouth, Ohio.

Eligible projects.—1 diffusion plant—40 percent domestic ownership. 3 centrifuge plants—100 percent domestic ownership. Existing federal facility at Portsmouth, Ohio.

Terms.—Guarantee applies only to domestic investment. Exact nature of guarantee to be spelled out in individual cooperative arrangements.

Limitations.—60 days for Congressional review of proposed cooperative arrangement, with approval by both Houses of JCAE—prepared concurrent resolution required. Contingent liabilities posed by cooperative arrangements limited to amount previously provided in appropriation act.

GOVERNMENT GUARANTEES FOR ENERGY FINANCING

Ms. Ross. In the last year or so, we have seen an increasing use of proposals for government guarantees for energy financing, and the second page of the material I handed out indicates legislation which has recently passed the Senate or which is pending in the Senate. Recently passed in the Senate are loan guarantees for energy conservation for synthetic fuel and for the development of geothermal resources.

The two bills that are presently pending, the uranium enrichment bill and the synthetic fuels bill, are important illustrations of the principals of this kind of financing.

URANIUM ENRICHMENT BILL

The uranium enrichment bill gives contractual authority for ERDA to enter into cooperative arrangements with private ventures. These arrangements would spell out in detail what the liability of the Government would be, and the circumstances under which it might have to take over the plants, operate them and perhaps experience an expenditure of as much as the full amount of $8 billion.

SYNTHETIC FUELS BILL

The synthetic fuels bill has four versions now in the House which provide different packages of loan and price guarantees varying from approximately $4.25 billion and also contingently billions that could be spent out by the Government at some future time.

The purpose of the guarantee is to induce a full capital to activities that would not have attracted funds or that would have much more unfavorable borrowing terms and to do this by sharing the risk of the project failing with the private investors.

RISKS IN ENERGY AREA

In the energy area, the idea is to induce producers to produce more or consumers to consume less than they otherwise would in order to reduce our dependence on unreliable imported oil. There are a number of types of risks that are faced in the energy area. Three of them are market risks, technology risks and regulatory risks.

The market risk stems from the administered price either through U.S. Government regulation or from the fact that the world oil price is administered by OPEC.

There are technological risks in trying to bring on line quickly new technologies that may have production costs or liability problems that people are unfamiliar with.

There are regulatory risks from the sense of environmental or safety standards that the Government might set or rules that it might have on the proliferation of nuclear materials.

So these are risks that are faced in the energy area, some of which are unique to that area. The types of guarantees proposed in this area, though, have tended not to be the traditional types of guarantees the Government has undertaken. The traditional types have involved many small borrowers, each of which has some kind of independent risk associated with it, a classic example being the Federal Housing Administration where the purpose was to try to get a new debt instrument, the self-amortizing, long-term mortgage, accepted by the market.

The risks that the market was concerned about were, in the Government's opinion, overvalued and therefore the Government stepped in with guarantees which were successful in the sense that an actuarily sound program was seized from the borrowers, that is the homeowners, covering any losses or defaults on the program which ran on the order of 5 percent. So this has been the classic kind of program, with the Government pooling risks and collecting fees that covered some or all of the defaults of a program.

With the new program in energy, we have a difference in that there are one or a few very large borrowers each of which, if they had some problem, would result in major liabilities for the Government, examples are uranium enrichment or synthetic fuels.

Also, these very elements of a common risk, that is instead of each of them risking or falling independently certain things like a world price rise of oil might affect all commonly.

BUDGET PROCESS AND FEDERAL GUARANTEES

Now, the budget process of these kinds of risks and the Federal guarantees are in the first place the impact on capital markets and economic activity, these are very large ventures, and just moving resources from one part of the economy into these ventures certainly makes a difference in the impact policy on the way the private economy operates. There is also a potential for future Federal outlays in the sense if a default occurred or if payments were necessary in order to forestall a default, these would appear in the budget at some future time; and although it is highly uncertain, given the uncertainty of the future, when that would happen, it is important for the budget process to try to get a grip on what those consequences might be and when they might appear.

One of the consequences, I think, in not trying to give that scrutiny and get a sense of when outlays might actually be experienced, is that you would see pressure to characterize some programs as guarantee programs even though they might have major spending implications, so that is the third point as far as the budget process.

There might be a tendency to try to do very useful public purposes through mechanisms that might not be the best because of their budget status.

So the first step for the Budget Committee in order to try to get a feeling for when these programs with risk-sharing guarantees are appropriate, the first step is to ask when they should be used, their effects on the private economy, and that is the subject of the seminar today.

Senator Moss. Thank you, Miss Ross, for helping to set the stage.

Now we will hear from our distinguished witnesses.

I want to say to all of those who are here to participate in this seminar that we are indeed grateful for your appearance and the expertise you bring to help us better understand some of the problems we face. Before calling on the witnesses I want to place in the record a copy of the material, outlining the background and purpose of these seminars, which was enclosed in the letter of invitation to the witnesses.

[The information follows:]

Energy Task Force: U.S. Senate Committee on the Budget

Seminars: Federal Financial Incentives for Energy Development, July 26 and 27, 1976, room 357, Russell Senate Office Building.

General.—The Energy Task Force has scheduled two hearings to explore the use and budget implications of various forms of Federal energy financing which have been gaining increasing attention recently. These are basically government guarantees which help private energy ventures borrow in private capital markets by sharing with the private sector the risk of project failure. Such arrangements may assure the loans of the private venture, the price at which the products of the venture can be sold, the overall success of the venture, or some other aspect of its operation. The Task Force will consider two principal questions concerning these guarantees, which constitute contingent liabilities of the Federal government and are generally proposed to appear only partially on-budget or not at all: (1) When is it appropriate to use them to achieve energy development goals, and what are their economic and fiscal impacts; and (2) how should the liabilities which they pose for the Federal government be calculated and represented in the budget? The Task Force wishes to develop a better understanding of the proper use and budget treatment of these financing mechanisms, with particular reference to significant energy proposals before the Congress regarding uranium enrichment and synthetic fuels—as illustrations of the principles involved.

MONDAY, JULY 26, 1976 9:30 A.M.

Subject.—Use of Federal Financial Incentives for Energy Development.

When is it appropriate for the government to use financial incentives in the form of loan guarantees, project guarantees, or other types of contingent liabilities to encourage the flow of private capital to private energy development ventures? How do these mechanisms work? How much do they add to the pool of available capital funds? How do they affect the capital markets? How can we tell when incentives are necessary to enable the private venture to go forward? When incentives are necessary, how can we tell that the project in question is valuable enough to warrant the cost of the incentives to the Federal government and the cost to the private sector of other investment opporunities foregone? What kind of incentives—loan guarantees, project guarantees, price guarantees—are appropriate for which types of projects? Can a substantial expansion of domestic energy production occur through the use of Federal risk-sharing incentives, and is this an appropriate direction for Federal energy policy to move in?

What kinds of energy investments and what kind of incentives are appropriate?

How do the proposals before the Congress on uranium enrichment and synthetic fuels measure up against these criteria? Are Federal incentives necessary in these cases? Do the benefits of energy production and information development justify the costs of Federal support? What are the effects on private capital markets of these two bills? Do the bills provide the best mix of incentives to achieve their purposes? Do they provide for a proper degree of sharing of risk and return between private industry and the public? Is it essential or desirable that the activities supported by these bills get underway in fiscal year 1977? If not, when might such projects best be begun, and what form of Federal incentive, if any, would be appropriate at that time?

TUESDAY, JULY 27, 1976 9:30 A.M.

Subject: Budgeting of Federal Financial Incentives for Energy Development.

How should Federal incentives for energy development in the form of contingent liabilities be provided for in the budget? Are there useful precedents? Are there useful principles? Are there occasions when the full value of guarantees should appear as budget authority at the time the guarantee commitment is approved by Congress? Are there occasions when no budget authority is necessary at the time the commitment is approved? Are there occasions when some portion of the guarantees should appear as budget authority? If so, how should that portion be determined? How should outlay figures be estimated and at what time should they appear in the budget? Are there useful general rules for budget treatment of contingent liabilities which can be adopted consistently across the range of energy financing legislation?

How should the contingent liabilities posed by the uranium enrichment and synthetic fuels proposals now before Congress, be represented on the budget in FY 1977 and future years. How appropriate are the currently proposed budget treatments—zero budget authority for uranium enrichment and 25% budget authority for synthetic fuels in FY 1977? If they are appropriate, why? If not, what would be superior, and why? What are the likely budget outlays in future years represented by these two bills?

Senator Moss. Please begin, Mr. Bosworth.

STATEMENT OF BARRY BOSWORTH, SENIOR FELLOW, BROOKINGS INSTITUTION

Mr. Bosworth. I supplied the subcommittee with a copy of some specifics on loan guarantee measures in the energy field. In the interest of saving time, since I believe you have a copy of it, I will not go over that one specifically this morning.[1]

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[1] See prepared statement, p. 12.

LOAN GUARANTEE PROGRAMS

I will make some general comments about the use of loan guarantee programs and other types of subsidy matters.

I would like to make clear I am not an expert in energy and I prefer not to have to comment on whether or not I have any particular view of whether or not the synthetic fuels program is a good idea or not. I would like to spend my time addressing the second question, given that you have made some determination that you do wish to subsidize synthetic fuels or some other similar type measure, what's the best way to proceed, what type of measures should be used?

There are basically three classes these would fall into. One of them is price guarantees. The second one is a loan guarantee program and the third one is Government direct participation in the project.

Now, there is no difference in theory between the use of loan guarantee programs or other credit programs such as direct loans by the Government, and that of using a budget method in that all of them are aiming at trying to affect the allocation of resources in the economy.

The difference, however, is that credit programs do it by trying to affect the ranking of projects in capital markets. Therefore, when we say we would like to have the economy spend $10 billion more on energy than it otherwise would, if you finance this through loan guarantee programs that 10 billion dollars' worth of resources must come out of 10 billion dollars worth of resource projects financed through the capital markets.

In other words, it will come at the expense of other investments in the economy, the burden will be placed on the capital markets as opposed to financing the project through the budget.

If you finance it through the budget then largely it would be financed by Government taxation or reduction in other Government expenditure programs.

So, we are faced here, I think, in the future few years with a choice between trying to say that energy should be financed by reducing other investments in our economy or energy should be financed by reducing Government expenditures on other types of consumption.

In view of the requirements in other industries, I have some doubts that further reliance on finance marketing by reducing other Government expenditures is appropriate.

EFFECTS OF LOAN GUARANTEE PROGRAM SHOULD BE DISTINGUISHED

Second, in considering the loan guarantee programs on other types of credit programs, I think it is crucial to distinguish the effects of a loan guarantee program and direct loans or purchases of credit in the secondary market because they have much different effects.

As a point of departure in trying to judge the impacts of financial market inventories, it is important to remember that no credit market program of the Federal Government has any impact at all in the world of sort of perfect or homogenous bond markets because in all cases they simply involve the Government buying a billion dollars worth of one type of private financial assets, but to pay for that it must turn around and issue a billion dollars worth of its own financial assets so the total number of bonds outstanding in the marketplace remains the same, the only thing that changed is some of them have the title on them now "owned by the Government" where they used to have the title "owned by the private sector."

IMPERFECTIONS IN CAPITAL MARKETS AS OPPOSED TO REAL SECTOR

Thus, in trying to look for significant effects of such financial measures, one has to look for imperfections in the capital markets as opposed to imperfections in the real sector.

Example of this mentioned by the previous speaker are one in the housing market. We did have a problem that you could never expect that the loan qualifications of a small little individual out in the west coast that no one had ever heard of before could ever be ranked equivalent to that of General Motors. The cost of gathering information about the quality of the credit applicants was simply too high. So in that sort of a situation one can eliminate that cost of gathering information which instituting a Government loan guarantee and in the case of the mortgage market I would judge that was a very successful program in the 1950's, but we basically believe today Federal loan guarantee programs have absolutely no effect on the housing market anymore because now the private sector has learned that lesson. It has learned the mortgage risks can be reduced by pooling of the mortgages and this private sector will make loans at higher risks in terms of higher loan devalue ratios, higher value of the house and other considerations than the FHA program is willing to consider.

One final point on that one important area to keep in mind is FHA was not a loan guarantee program, it was a loan insurance program. The people who got the guarantee paid for it in the form of an insurance fund that was set aside with the Federal Government only being a sort of last resort.

Second, most of our economic analysis has indicated that because the only impact of these programs can come from imperfections in the capital markets, their effects are largely temporary in nature because any interest rate differential that is not rational that develops in the capital market will, in time, ultimately be eliminated. So in the case of things like Fanny May operations and the Federal Home Loan Bank Board most of these impacts are at most a year in duration and after about a year they are eliminated.

LOAN GUARANTEE PROGRAMS ARE VERY DESTRUCTIVE

Loan guarantee programs specifically, I think, are very destructive of the normal evaluation procedures that take place in the private market economy. You must realize although they sound innocent that when you extend a loan guarantee program the lender has just become relatively indifferent to the value of the project since it is of no interest to him whether a default occurs or not. In an economy such as ours, every day people are proposing all sorts of crackpot notions and other types of measures that they would like to have financed and it is the purpose of the lender to say "that is a bad risk with my money," and he refuses it and turns it down.

It is the major reason today that buggy whip manufacturing is not a major industry anymore in the United States. But if there is a loan guarantee program extended to anybody who wants to build a plant for the purpose of producing buggy whips, any lender would be perfectly willing to extend credit to such a use.

So, you must realize that when you extend loan guarantee programs, the Government must replace the market, the Government must step in and do its own evaluation of the projects before it extends the loan guarantee program.

LOAN GUARANTEE PROGRAMS INTENSIFY INCENTIVES TO DEFAULT

Then we raise the question of whether or not in very many situations it is true that the Federal Government knows something that the private market doesn't know. Does it know that these are really good projects, but for some reason the private markets, foolish, though it wants to earn a profit, simply cannot realize these are really profitable undertakings? There is a second problem that comes up and that is a loan guarantee program does intensify the incentives to default because whenever the owner of a project which has a loan guarantee program gets a situation of negative equity and all he has in the property is negative value, he will now default on the project. This has been a real problem, for example, in the case of the student's loan program and a very severe problem in some of the inner city housing loan guarantee programs where the Federal Government extended such a high value of loan to value ratio that there was no net value left after the loan had been extended.

A second problem about default incentives is you get a premature shutdown of any economic project the moment you extend a loan guarantee program to it because a normal economic project, and let us take here a case of a synthetic fuels program, suppose there are no variable costs to operating the plant whatsoever, but all the costs are capital costs and they come out to be about $20 per barrel per year, then in that sort of case, if you have $20 a barrel of cost and they are all capital costs, even if you can only sell the project for a penny a barrel, you might just as well keep right on producing because at least you are minimizing your losses.

The important point is that in the private market, when there is no loan guarantee, a business firm will continue to operate and sell its products as long as the price of the product covers the variable cost because at least he is making some income over variable cost with which to try to reduce his fixed costs.

However, if he has a loan guarantee program, he will default the moment the pricing falls below the total costs of the product that he is producing. So he will default much earlier in the case of an uneconomical project than he would if there was no loan guarantee.

USE CRITERIA FOR LOAN GUARANTEES

I think there is also, a final point to make, a criteria can be used for loan guarantees to say when are they appropriate and when aren't they appropriate? If the Government is trying to subsidize the particular type of undertaking, a loan guarantee program is an appropriate measure to use when the source of the difficulty is in the financial markets. When it is a financial risk then a loan guarantee can be used but when it is real sector risk, for example, in the case in the synthetic fuels program—I am not an expert in this field—a rational real sector price would be in the neighborhood of $20 a barrel.

I think the problem with these projects is not that they are highly risky but the real sector price risk is extremely high.

The investors are worried that the price of oil equivalents will not be $20 a barrel. In that case, if you have that sort of real sector risk you should look to price guarantees and not to loan guarantees because the problem is not in the financing sector. The financier is quite rational in saying there is a good chance these projects will go bankrupt under current real sector conditions. Nor is there an opportunity in this particular case to try to reduce the risk in such a case by pooling of loans as we did in the mortgage market. Pooling is not a viable alternative because if there is price risk and the price of oil could lapse all synthetic fuel programs will go bankrupt, not just 1 or 2, unlike the housing sector where you could always say the probability is most homeowners will pay off their loans.

Senator Moss. Thank you, Mr. Bosworth, for your remarks.

PREPARED STATEMENT OF BARRY BOSWORTH, SENIOR FELLOW, BROOKINGS INSTITUTION

LOAN GUARANTEE PROGRAMS

I wish to thank the Subcommittee for the invitation to comment on the use of loan guarantee programs to promote growth in energy supplies. While I am aware of most of the issues, I wish to make clear that I am not particularly knowledgeable in the energy area and I wish to limit my remarks to the economic effects of loan guarantee programs. Thus, I will only consider the issue of loan guarantees versus other incentive programs without addressing the first issue of whether or not the proposed plants should be built. In this regard our previous experience with loan guarantees may be of value to the Subcommittee. This specific issue is closely related to my own research interest in financial market structure.

SPECIAL INCENTIVES IN ENERGY AREA

First, the decision to provide special incentives in the energy area must be seen as reflecting a tradeoff with other claims on the Nation's resources. If more resources are moved into the energy area, less will be available in other areas of private investment, consumption, and government expenditures.

If this is done through preferred access in the capital markets, the offsetting reductions would come from other investment—primarily housing and higher risk loans to small business.

In contrast, direct budgetary financing would concentrate the offsets in other government expenditures and current consumption.

The fact that these programs might create jobs is irrelevant to this particular decision, since such a statement is true of any economic expenditure and is not a basis for favoring one over another.

At the same time, it is unrealistic to believe that such a program will have a serious disruptive influence on capital markets.

AMOUNT OF INVESTMENT

Second, the simple existence of a loan guarantee program does not necessarily increase the total amount of investment in the subsidized area.

It is very hard to exclude projects that would have been undertaken in the absence of a guarantee, and the guarantee may be exhausted by these projects.

Such substitution effects have caused serious problems for student loan guarantees and some parts of the home mortgage market.

Because the administrator of such a program fears recriminations in the event of default the actual risk criteria may be no easier than that of the private market.

Thus, a loan guarantee program will automatically take over the whole market, and its maximum size must exceed the amount of investment that would have occurred in its absence if any incremental increase in effort is to result.

TERMINATION OF PROJECT

Third, a loan guarantee encourages the termination of a project at an earlier date than without a guarantee.

For example, assume operating costs are $10/barrel of oil equivalent and that fixed capital costs at $10/barrel require a price of $20/barrel. Without a guarantee, the plant will make a profit at $20/barrel; but, more important, it will continue to operate at any price above $10/barrel (operating costs) until the fixed capital plant is exhausted as a means of minimizing the loss.

However, with a guarantee the firm will have an incentive to default at any price below $20/barrel and leave the government with the problem of operating the plant.

Alternatively, either price guarantees or government financial participation avoid this problem of premature shutdown.

DISTORT INCENTIVES AND BECOME A TAX HAVEN

Fourth, in combination with current tax laws, a loan guarantee program can seriously distort incentives and become a tax haven rather than a viable economic operation.

For example, a 90-percent loan guarantee together with a 10 percent investment tax credit results in zero owner equity after the plant is constructed.

If at any time the owners' equity becomes negative, the rational investor will default.

In future years rapid tax depreciation and depletion lowers the critical level of the loan guarantee even further.

Since many of the knowledge benefits are likely to accrue in the construction phase and first few years of operation, there is a high level of default risk before the loan is repaid.

Such a problem of loan defaults was serious for some parts of the federal housing program, and there is no reason to think that businessmen are less rational than homeowners.

Thus, it will be very important to insure that any combination of loan guarantees, tax measures, and construction loans maintains a substantial amount of owner equity in all years of the project.

Certainly, I would not expect any large scale defaults to actually occur. Rather a possibility of a "Lockheed" situation exists where the embarrassment of default results in increasing future subsidies.

ATTRACTIVE TO PUBLIC UTILITIES

Such projects are likely to be most attractive to public utilities.

Rate of return regulation allows the cost to be folded into the rate base.

The opportunity to have a guaranteed source of supply is likely to be of more concern than costs, since the risks of being cut off from natural gas supplies in the future are reduced.

However, a program to reduce the risk position of the public utilities is not consistent with efforts to explore uncertain costs of new energy sources.

Therefore, regulated public utilities should probably be excluded from such a program.

FIRST FEW WILL BE UNPROFITABLE

I believe that the most realistic view of these projects is not that they are simply of high risk, but rather there is every expectation that the first few will be unprofitable.

For a few industries they are attractive as a guaranteed source of supply—particularly regulated utilities where cost is not of primary concern.

But, for others, the problem is most similar to that of infant industries where those who follow will benefit from the learning aspects of the first. In such a case, an effective stimulus of these new technologies, if desired, will require a direct government contribution to costs rather than just a loan guarantee.

RISK PROBLEM

A clearer insight into the risk problem can be obtained by consideration of three alternative cases.

Case I.—The project is protable at mean expected future prices but there are risks of price declines.

In this case a loan guarantee simply encourages a premature shutdown at any price below total unit costs instead of continuing to operate at price above variable costs. The investors are protected against loss but the project is not continued.

On the other hand, price guarantees eliminate this type of risk.

Case II.—The project is unprofitable at the expected price.

Normally, the project would not be undertaken but might be with a loan guarantee with an intention to default because the returns are positive in the first few years because of tax or knowledge benefits.

Case III.—The risks result from uncertainty about costs rather than prices.

Again, a loan guarantee results in default and premature shutdown; but, in addition, a price guarantee is inappropriate. in this case, only direct government participation in the costs will reduce risks. Any use of adjustable price guarantees begins to look like cost plus contracting.

In practice, any project is likely to be a mixture of these cases, but in no case is a loan program an appropriate response to risky projects. It encourages their beginning but it also encourages their early termination.

Loan guarantees are usually designed for situations—such as home mortgages—where the costs of gathering information about many small lenders is very high and where a pooling of many loans reduces risks and allows for the use of average default experience as a means of charging an insurance fee. This is not the case for a few large projects where the private market knows as much or more than the government.

The fact that these are large projects does not itself create a need for a guarantee since U.S. capital markets have frequently been able to meet such needs in other areas with participatory financing.

SUMMARY

In summary, I am most concerned that loan guarantees will significantly reduce incentives to develop viable production processes because of premature decisions to quite, limited owner equity, and their potential use as tax havens. In addition, I think it undesirable to place further burdens upon the capital markets as the means of directing resources to the energy field.

Direct government loans financed out of tax revenue would reduce competition with other capital projects. But they would also involve the problem or perverse incentives when investors can avoid the risks.

Price guarantees seem to be the most direct response to the issue of future price uncertainty, but they should include a buy-out feature based on the value of the remaining capital. Otherwise, the government might be committed to subsidizing high cost energy if alternative sources result in much lower than expected future prices. Such a price guarantee must be equal to or less costly than a loan guarantee over the life of the project.

The problem of cost uncertainty can only be met by a sharing of capital and operating cost through a joint venture as was done for the nuclear programs.

Loan guarantees, construction grants, and other subsidies to capital costs can also seriously distort the evaluation of the most economic technique when choosing between those which are capital-intensive (subsidized) versus operating cost-intensive (unsubsidized).

Finally, I wish to emphasize that my remarks are directed only at the alternative means of subsidy and not the desirability of the overall venture. I am primarily concerned that loan guarantees result in significant distortion of incentives since they are of value only in case of failure. A loan guarantee is of minimal value to the most viable projects and of great value to the most doubtful. I am not convinced, after consideration of tax advantages and the accrual of knowledge in the early years of the project, that sufficient owner equity will remain to insure repayment of the loans. I believe that price guarantees and financial participation by the government more directly address the issue of risk without distorting incentives. At present, however, the proposed form of the price guarantee proposal is to vague to judge its effect.

I would oppose the construction grant to public utilities since it encourages vertical integration of a natural monopoly and is an inappropriate special response to a general industry problem of debt capacity. Unless financed by a tax on users such grants artificially lower energy prices and discourage conservation.

Senator Moss. We will have the opening remarks from all of the panel first before we begin our questions. But one of the points you made will be appropriate for later discussion. You pointed out that another factor to be considered is the threat of embargo, and that apart from pure economics it is worth something from a governmental standpoint to be able to produce synthetics equal to the costs of natural hydrocarbons.

Mr. Lewand we would be glad to hear from you next.

STATEMENT OF STANLEY LEWAND, VICE PRESIDENT, CHASE MANHATTAN BANK, NEW YORK CITY; ACCOMPANIED BY MICHAEL B. BRACY, VICE PRESIDENT, CHASE MANHATTAN BANK

Mr. Lewand. To my left is Mr. Michael B. Bracy, vice president, Chase Manhattan Bank.

I would just like to make these prefatory remarks to place in context any comments I may make during the seminar.

GOVERNMENT SUPPORT

As a general rule, we feel that there should be a strong presumption against Government support of private ventures whether by means of direct financing, guarantees, or otherwise.

While such Government support is efficient in allocating capital to the anointed venture, it is not without cost to the taxpayers who assume all or part of the business risk in lieu of the venture's beneficiaries. In the process the venture is insulated from the usual economic disciplines, including that of risk and return. Only where the economic equations fail to consider critical factors should the Government support be considered and then only to the extent necessary to deal with these omissions.

URANIUM ENRICHMENT

The Government support of uranium enrichment is in a somewhat different category. Here the Government controls the secret technology and owns the only plants in commercial operation. The several ventures which would be paying royalties to the Government, not surprisingly, have asked for process guarantees. These guarantees could be considered appropriate to a commercial licensing transaction and thus are beyond the scope of these remarks.

PROJECT RISK

Instances in which Government support might be appropriate include those where a significant degree of the project risk has been introduced by the actual or potential action or inaction of the Government itself. The current state of the nuclear fuel reprocessing industry comes to mind.

Other considerations which are extremely important but often abused are national security, energy independence, and foreign policy. I would urge the Congress to be very discriminating in applying these considerations. The blankets of national security and energy independence in particular have been used to warm up many dubious proposals.

The ventures which are the main subjects of today's discussion are high technology, in some cases unproven on a commercial scale, and typically would be financed solely with equity or "risk" money, since lenders nearly always look for some kind of track record to give them comfort that their loans will be repaid. Financial theory teaches that sufficient equity funds will be forthcoming for a project if the investors are confident that they will be allowed to earn a reward commensurate with the risk, should the project succeed. Since the huge amount of equity investment required for the synthetic fuel and enrichment projects has not been forthcoming, one must conclude that the risk/reward equation does not equate.

Government support is not a device by which capital is created but by which capital is moved in a particular direction. Demands for capital is satisfied in favor of the Government supported project, but perforce, be assured, that such a device makes capital attraction at the lower end of the spectrum that much more difficult.

We believe that consideration of synthetic fuel and uranium enrichment project guarantees is warranted in the light of these prefatory remarks.

Senator Moss. Thank you for your comments, Mr. Lewand.

We turn now to Mr. Cannon.

STATEMENT OF J. FRANK CANNON, DIRECTOR OF SALES, MARKETING, AND COAL GASIFICATION, ENGINEERING AND CONSTRUCTION, KOPPERS CO., PITTSBURGH, PA., ACCOMPANIED BY JAMES W. BUMBAUGH, SENIOR SPECIALIST

Mr. Cannon. I, too, have submitted my total statement, but I have maybe a 5-minute summary of that total submission.[1]

I am an engineer, not an economist, but being director of marketing and sales of coal gasification, I would like to preface my remarks on our experience throughout the country in the last 5 years.

As a Nation, we are at the mercy not only of economic but of political decision by nations and foreign cartels upon which the United States now relies for over 50 percent of its oil requirements. This critical reliance on the whim of foreign political interests coincides with a serious and increasing diminution in domestic natural gas resources and production.

COST OF FOREIGN OIL

As recently as 1971, the United States spent only $3.7 billion for foreign oil. It is expected that this year this figure will have grown almost tenfold to $35 billion and that by 1980 this figure likely will grow to $45 billion at current prices. If foreign suppliers should raise the price of oil to $15 f.o.b. Middle Eastern ports, from the present delivered price of $13.27, oil imports could cost us as much as $60 billion a year. Thus the outflow of dollars poses an increasingly serious problem to us as a Nation.

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[1] See statement of Koppers Company, p. 18.

More serious, though, is the ability of these foreign interests to embargo supplies to us entirely, as they have in the past, or to juggle their delivery or prices at will to discourage our development of an industry to relieve us of reliance upon them.

Conservation can help somewhat but industry and utilities need fuel to operate. They are the vital life blood of our Nation.

COAL GASIFICATION

As a result of present shortages and dangerous vulnerability to foreign decisions many American corporations and utilities have been and are in touch with Koppers because of our ability to build medium Btu coal gasification plants with existing, proven technology now successfully in use in several countries abroad. Our process, known as K-T or Koppers-Totzek, can utilize any grade of coal—which we as a Nation have in abundance—to produce a gas which can be used by industry in place either of oil or natural gas to manufacture chemicals such as ammonia and methanol or to serve the hearing requirements of their basic processes. Our gas can also be used to generate electricity.

Use of this 300 Btu gas from coal could replace very considerable volumes of natural gas and oil for more critical uses and could contribute substantially to the solution of our very dangerous national energy dilemma.

However, none of this existing and presently available technology is now being used in this country. It is not because normal business decisions do not control in this field. A facility which might be economical today under certain conditions could be rendered a fatal blow tomorrow by a capricious foreign political decision on price, or on the use of extensive amounts of natural gas which could produce cheap ammonia abroad if some Middle Eastern countries decide to utilize gas which they now flare.

Political variables of this type pose political problems for us as a nation. Private industry cannot be expected to cope with them. For this reason, the Federal Government has a very legitimate and urgent role to discharge in the form of incentives and assurances which will motivate American corporations to risk the very considerable capital investment required to give this country a vitally needed synthetic fuels industry.

INCENTIVES AND ASSISTANCE IS NECESSARY

For our discussions and planning with several substantial prospective customers and from a survey which we have conducted, we are convinced that a package of incentives and assistance is necessary; some will use one incentive, others will require several and our information indicates that what may be satisfactory incentive to one may be no incentive to another. Alternate incentives, therefore, are necessary and, we feel, are wholly justified by vital national interests which transcend corporate interests.

Koppers, therefore, commends to you H.R. 12112 reported by the House Committee on Science and Technology together with—section 19—amendments proposed by the House Committee on Banking, Currency and Housing.

Together, these will provide a start. Their loan and price guarantees, though limited, are important and necessary aids to encourage industry to invest in synthetic fuels facilities. Other aids such as low interest loans, tax incentives like investment credits and accelerated plant writeoffs, or industrial development bonds also are needed and we hope the Congress will give its early attention to these additional stimulants which could be vitally important in furthering our effort to obtain energy independence in a world in which large segments are all too often hostile to American interests.

In conclusion, I would respectfully remind you that every day's delay in enacting a viable synthetic fuels commercialization program prolongs our country's vulnerability and postpones the day when this vitally needed program will be able to ease foreign political and economic threats which weaken our freedom of action in the world community.

PREPARED STATEMENT OF KOPPERS CO., INC.

My name is J. Frank Cannon. I am an engineer employed by Koppers Company, Inc., with principal offices in Pittsburgh, Pennsylvania. I am director of the company's activities in the marketing of coal gasification facilities.

We are pleased to appear before you today to offer testimony on the necessity for federal incentives in support of the establishment of a synthetic fuels industry in the United States to relieve our critical and dangerous reliance on foreign fuel.

For the last four years, Koppers has been contacting many companies within various industries to acquaint them with our coal gasification process. Our chairman and other company officers also have testified before various Congressional committees in this regard. Accordingly, our remarks reflect insight we have gained from this industrial/governmental interface.

At present the U.S. is importing over 50% of our oil requirements and natural gas companies have curtailed and are announcing further curtailment of gas supplies in the immediate future, as early as this coming winter. An even more dismal projection appears beyond that.[1] For example, it is expected that the U.S. will spend some $35 billion in 1976 for imported oil based on the current price. In 1980, this figure is likely to go to $45 billion—at the current price. If the price of oil rises to $15 per barrel f.o.b. Middle Eastern ports, we could spend as much as $60 billion. These figures compare to $3.7 billion spent for imported oil as recently as 1971.

NATIONAL ENERGY PROBLEM

The U.S. obviously is not self-sufficient in energy and the situation continues to deteriorate. The ramifications of our current situation are frightening. It is certain that U.S. vulnerability to energy supply interruptions will become worse, not better, in years to come. And there is not much anybody can do about it unless we change direction immediately and act to form a positive national energy policy with federal and state legislation that will motivate industry to move into synthetic fuels to meet their energy demands.

We have no time to wait for the evolution of second and third generation technologies to provide energy solutions. The problem facing industry is in the very near term, the next 5 or 6 years. We must move now with the technologies at hand to start producing even partial solutions to our national energy problem. At the same time R & D should and must continue at a rapid pace.

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[1] Reference: Forbes, "The Invisible Crisis," July 15, 1976, pp. 26–29, James Cook.

INDUSTRY EXPERIENCING PROBLEMS

Addressing the question of the applicability of Federal incentives to the synfuel industry, we would like first to comment on the problems industry is experiencing. While many companies have shown a sincere interest in coal gasification, none has been willing to commit the large sums of capital required to substitute coal gasification for natural gas or other fossil fuels. Why? Because as they are curtailed on natural gas, they can with a very small investment convert to oil as a substitute for their energy needs. The capital requirements for a gasification plant can be so intensive that the required capital could be equal to, or a major portion of, the total net worth of even a sizeable company. This predicates an unsound debt-equity ratio.

ECONOMIC AND POLITICAL RISKS

The risks are economic as well as political in nature. In the first instance, a coal-based plant might have to compete with plants operating with current, artificially depressed costs of gas and oil feedstocks. Such a plant cannot do so in current circumstances. On the political risk side, we face the possibility of price manipulation by the oil producing countries. Should OPEC, for instance, decide to act capriciously and lower the price of oil, either for political reasons or to increase sales revenues to meet their internal requirements, the coal-based plant could becme a white elephant. OPEC could even do this by capturing their considerable volumes of flare-gas, making ammonia from it, and dumping their ammonia into our cornbelt area at prices which bear no relation to normal production costs. American industry has no control over this possibility.

Essentially, the oil producing nations have a demonstrated capability of producing a national emergency in the U.S. at will. No degree of stockpiling of supply on our part can provide us with long-term protection against energy crises.

Fundamentally, what we are saying is that the risks inherent in making large capital investments in synthetic fuel plants at present are supernormal and are beyond the control of industry to defend against.

FEDERAL AND STATE INCENTIVES ARE APPLICABLE AND APPROPRIATE

Categorically, we can say from our experience that federal and state incentives are both applicable and appropriate. In fact, federal and state governments are the only bodies that can effectively provide these essentials.

Government policy consideration must be given to the capital needs of industry which result from expenditures caused primarily by the national goal of reducing reliance on imported fuel. The fact that our domestic supply of oil and natural gas continues to diminish adds further emphasis to this critical situation.

To this point, we the public and you the legislators have made only easy decisions regarding our energy situation. We've talked about the problem; you've funded money for research, development and conservation. However, no one has moved in a positive sense to effect an immediate solution to the problem.

Given the fact that it takes some 3 years to design, build and initiate operation of one of our gasification plants, it appears we're already in deep trouble. If we were to start right now, it still would be some 8–10 years before we could gain appreciable production from coal-based energy plants.

INCENTIVES FOR SYNTHETIC FUELS INDUSTRY

We would like to comment now on the question as to what are the most appropriate techniques for providing incentives for a synthetic fuels industry. Again, from our experience, we recognize that stimulation should be provided through federal and state legislation in two broad areas:

1. Stimulation of plant construction through any one or a combination of the following incentives: low interest loans, tax incentives such as investment credits and accelerated plant write-offs, or industrial development bonds.

2. Energy cost equalization to ensure that those who adopt coal gasification will not be placed at a future disadvantage with competitors if potentially cheaper energy sources should materialize. Also, equalization should be applied when some industrial competitors are permitted to remain on conventional feedstocks available at depressed prices. To prevent pioneers in adopting new energy sources from being unjustly penalized by such developments, subsidies to provide cost parity

should be provided. If such price supports become too onerous for the government, it could have the option of purchasing the plant for standby reasons of defense or in the event of an embargo.

Obviously, each corporation, and certainly utilities, have different capital problems. It is therefore impossible to suggest one funding solution for all. But it is possible to suggest the foregoing combination of approaches each of which might apply to some companies but not necessarily to all. To do the job, a package of incentives is required.

At the present, there is a bill in the House of Representatives, H.R. 12112 that has the potential of providing loan guarantees and price supports for a synthetic fuels commercialization program. To date, this appears to be the most positive step that has been taken by the government to move industry towards utilizing existing technology and establishing synthetic fuels operations.

Koppers recently conducted a survey, contacting those firms for whom we have done analytical/engineering work in coal gasification. Our survey disclosed that those contacted felt that the following incentives, listed in order of preference, were necessary: 1. Accelerated depreciation—plant write-off in 3–5 years. 2. Increase of present investment tax credit. 3. Ability to issue tax-free bonds—utilities primarily. 4. Price equalization of substitute fuels with price of oil. 5. Loan guarantees by federal government. 6. Government purchase of plant with provision for leasing to industry.

Of these incentives, we note that accelerated depreciation is a familiar and proven incentive to industry based on World War II experience. It decreases tax revenue in the early life of the investment, but increases it dramatically after write-off. Or, it can result in decreased energy cost to the consumer. There is the additional benefit of job creation, consumer spending, and a general increase in GNP in the area served by a syn-fuel plant, the effect of which is not estimable at this time but which certainly would be positive.

Construction grants, investment cost sharing by the government or subsidies applied to the sale of production units from a facility. are particularly desirable for a plant operating in a non-captive market situation; a commercial producer of ammonia fertilizer as opposed to an electrical or gas utility, for instance.

Loan guarantees are modest incentives applicable to a utilities-type of operation wherein costs, hopefully, could be rolled into a base rate structure. Nevertheless, loan guarantees are incentives in fact and could contribute to energy problem solution.

CAPITAL COST—COAL GASIFICATION PLANTS

Let us consider now the problem of budgeting incentives for a synthetic fuels industry. To begin, let us establish an overview of the problem. If we were to replace the equivalent of a million barrels of oil per day for use in industry, it would take some 500-plus Koppers-Totzek, multiple-head gasifers which we suspect would be located in some 25 different plants. Each of the plants would probably have 20 gasifiers. At about $25 million for each gasifier, each plant would cost about $500 million. The total capital cost of these 25 plants would approximate $12.5 billion. It would take about 1800 craftsmen and journeymen, working for 3 years to build each one of them. In total, it would also require around 150 million tons of additional coal per year. This is about 25% more than we now produce. Additional mines would have to be opened. Equipment to mine that coal would have to be produced.

In short, the task is huge and huge volumes of capital would be required to execute that task. But all of the plants couldn't be built in the the next 3 or 5 years. We could build no more than 3 or 4 at a given time. But we must start now since time has run out for us. It is interesting to note that a 1 billion barrel emergency stockpile of oil would cost about $12.5 billion. But the same investment would provide continuing production facilities to make 1 million barrels per day of oil equivalent for at least 20 years depending on the life of the gasification plants. It should also be appreciated that such a stockpile would greatly aggravate the U.S. balance of trade deficit and would contribute nothing to the creation of necessary jobs in this country or to our gross national product.

BUDGET FUNDS UNTIL PLANTS BECOME SELF-SUPPORTING

We do not feel that funds should be budgeted for all synthetic fuel plants for all time. We do feel, however, that funds should be allocated until these plants become self-supporting in the energy marketplace. We take issue with the classical economic approach wherein supply and demand determine price only in the conviction that time has run out and the country cannot wait any longer.

Bill H.R. 12112 referred to previously authorizes, based on our last review, some $2 billion to support the establishment of commercial synthetic fuel plants wherein existing technology could be employed. Of this $500 million would be for price support application. In light of the magnitude of the problem, we think that the $2 billion is a minimal figure and that additional funds will have to be allocated for such a period of time until syn-fuels become generally competitive with conventional sources. This might not be for the next 10 years or better. But $2 billion is a start.

Unfortunately, we have no commercial gasification plants operating in the U.S. We do, however, have some 16 plants that operate or have operated in various other countries on a commercial basis. Since these plants usually are government-owned or subsidized, and the primary concern is availability of production, it remains for us to prove out the economics of operation of these plants in the U.S. As the commercial viability is established, the economic posture of these plants will become more recognizable. At that time, budgeting techniques and dollar volumes required will be easier to ascertain.

Specifically, some effective contractual techniques are recognizable and appear to have potential for providing insight to budgeting. For instance, any sizable coal gasification plant would be predicated upon long term contracting for coal supply. Certain clauses could be built into such a contract wherein the coal supplier could remain whole even if the price of oil should drop to a point where oil feedstock would be cheaper than coal. The coal supplier could be afforded coverage of his fixed costs even if no coal were delivered and the plant switched from coal to oil.

I might mention here that our K-T technology incorporates that important flexibility for changing feedstocks, among some other important advantages.

GASIFICATION NOT THE ULTIMATE ANSWER

In conclusion, we face a very difficult problem. Gasification is not the ultimate answer. But it is immediately available and can make a substantial contribution to the solution, along with other technologies and conservation. Yes, we include conservation because it will stretch out our energy reserves even if it doesn't create new sources. We at Koppers feel that the energy problem can be met via the synergistic effect of both existing and new technologies and our existing gas and oil reserves.

We are equally convinced that we must act now or experience a crisis situation in the next 10 years that could be beyond imagination.

Senator Moss. Thank you, Mr. Cannon. We appreciate your statement and your pointing out the pressures there are on these decisions that the Congress faces.

Now, Mr. Arledge, we will be glad to hear from you.

STATEMENT OF CHARLES S. ARLEDGE, PRESIDENT, GARRETT NUCLEAR CORP., TORRANCE, CALIF., ACCOMPANIED BY JEROME S. KATZIN, KUHN, LOEB & CO.

Mr. Arledge. Thank you.

Mr. Chairman, and members of the committee. I am pleased to have the opportunity to speak to you today. I am Charles S. Arledge, president of the Garrett Nuclear Corp. With me to participate in today's discussion is Mr. Jerome S. Katzin, a partner in the investment banking firm of Kuhn, Loeb & Co., and our financial adviser on the centrifuge enrichment project.

The Garrett Nuclear Corp. responded last year to a request from the Energy Research and Development Administration to submit a proposal for the construction of a uranium enrichment plant using the gas centrifuge process and costing approximately $1 billion. Implementation of this proposal is contingent upon the early passage of the Nuclear Fuel Assurance Act of 1976. Passage of this act, which provides for U.S. Government assurances in the areas of technology guarantees, product backstops, and debt assurance is, in our opinion, absolutely mandatory to provide an acceptable basis for the commercialization of enrichment services and to secure project financing.

URANIUM ENRICHMENT PLANT—BUSINESS RISKS

The various assurances contained in the act are necessary since without them the project cannot initially be financed. This situation occurs because of certain unusual business risks and other factors which are unique to this new industry as follows:

(1) The gas centrifuge process is unproven on a commercial scale.

(2) The gas centrifuge process has been developed by the U.S. Government under a complete veil of secrecy.

(3) An enrichment plant is highly capital intensive, requiring more than $4 of investment for each dollar of sales generated.

(4) The amount of capital required for a single project of economic size is unusually large; about $1 billion in this case.

(5) No historical financial data is available to the investment community.

(6) Plant licensing criteria are undefined and untested.

(7) Various governmental policies and actions could severely harm the economic viability of the project, for example:

(*a*) A nuclear moratorium.

(*b*) Development of a competitive low-cost enrichment process.

(*c*) Changes in ERDA's existing policies for the sale of enrichment services.

(8) There are no alternative uses for the plant and thus it would have a very low salvage value.

NUCLEAR FUEL ASSURANCE ACT

It is important to recognize that the Government assurances contained in the Nuclear Fuel Assurance Act of 1976; (1) are temporary and will be required for only approximately one-half of the project's life until it is refinanceable in private markets without guarantees; (2) represent only a small fraction of the total financial investment required for expansion of enrichment capacity through the year 2000; and (3) are highly unlikely to be used. Additional uranium enrichment capacity is a necessity for the future development of nuclear power. If this capacity is to be provided by private, U.S. sources, the assurances contained in the Nuclear Fuel Assurance Act are essential in the initial stages of the program.

In conclusion, I wish to emphasize the necessity that the Nuclear Fuel Assurance Act be passed as soon as possible. A continued lack of resolution of our country's policy toward commercialization of the uranium enrichment business has encouraged foreign government/industry cooperation to build enrichment facilities and has thereby eroded the substantial world market available to U.S. producers. We sincerely hope that the current attempt to resolve this issue, through early passage of the Nuclear Fuel Assurance Act, will be successful. We stand ready to do all we can to assist.

Thank you very much.

Senator Moss. Thank you, Mr. Arledge.

Regarding the Nuclear Fuel Assurance Act, is that a sale price guarantee?

NO PRICE GUARANTEES

Mr. Arledge. No; there are no price guarantees. There are the three assurances I mentioned.

First, for all of these reasons I have mentioned, there is an assurance so that the debt lender could be protected if a problem occurs in the plant. Second, since it is the Government's technology, there is a technology guarantee which I believe was mentioned before. This is a normal commercial process when you have a technology you are transferring to others, so that is relatively straightforward. Finally there must be some sort of product backstop. The utilities are very concerned about assurance of supply. In fact, they put that ahead of price in their whole list of priorities: Thus, the Government must provide a certain assurance of product supply to the utilities in the early stages of the project. There are no price guarantees, to answer the question.

PRIVATE FINANCING IMPOSSIBLE

Senator Moss. Are the risks you describe of such magnitude that private financing without Government assistance is impossible to obtain?

Mr. Arledge. It is our opinion that private financing without government assistance is impossible. We did an extensive survey of various banks and we talked to many investment bankers before we got into this project. Obviously, our first approach was to try to do it without Government assistance and we have concluded that we cannot.

Senator Moss. Is this the advice of your consultant, Mr. Katzin?

Mr. Katzin. Yes; it is, Senator. We have gone into this very carefully and for the reasons stated, and also because in order to keep the price of power down in this country as it permeates our whole price structure, this capital has to be raised as economically as possible. Therefore, the structure that is envisioned for the capital of these companies is highly leveraged with a great deal of debt borrowing. That debt is required in such quantities that it has to come from the fiduciary institutions of this country and the banks and pension funds who are by law unable to lend to a risk venture. They can only lend these vast funds they hold as fiduciaries on an assured certain payback. That is why, in our opinion, this is the only way to attract the vast sums that are needed to get the venture underway.

CAPITAL INVESTMENT

Senator Moss. In his opening statement, Mr. Lewand indicated that Government allocation of capital at any time simply skewed the market a little which eventually had to try to straighten itself out. But haven't we got a really difficult problem here in that there is not only this threat Mr. Cannon mentioned of embargo that could conceivably bring our industry almost to a halt? The second factor, and the one that Congress wrestled with so long is the question of the cost of energy to our consumers. This was the basic argument between lifting all controls and letting the price go as high as it would in order to generate the capital investment as against the other view which said, "Look, we just can't do that to all the consumers because it would have such an enormous impact on our economy, inflation, and employment," Considering these other factors, would you still answer essentially as in your opening statement that capital will simply find its way to wherever there is a high enough demand?

ANTICIPATED RETURN AND REDUCED RISK

Mr. LEWAND. Not to where there is a high enough demand but to where the attraction to the investor is the greatest, and that is what moves capital in one direction or another. It can be an amelioration or a modification or a moderation of the risk which is attained via the Government-support program.

You have given the security, whether it is a bank note or an institutional note, you have given them a creditworthy instrument that may not have existed had they been asked to invest in the technologies that we are talking about that are unproven and are undifficult. So what you are doing, is you are moving in effect the mind of the investor toward the more attractive risk here. That risk, in being attractive, can sometimes be attractive in the context of the return it promises to the investor, and in this case, and we deal here in the context pretty much of the regulated sector of our business, the risk/return ratio is frequently forgotten or is frequently ignored in this matter of investment attraction.

You don't put your money in a venture that is high risk and promises 15-percent return if that return should be 25 or 30 percent in order to compensate for the high risk of losing your principal. So there are two factors. There is the factor of the anticipated return that the investor can look forward to, which will move his money in that direction, and there is the factor of the reduced risk which assures him of a return of principal.

The combination of the two, of course, makes the most attractive investment.

Senator MOSS. Thank you.

Senator MCCLURE. I wonder if I could ask one question before we leave Mr. Arledge.

CAPITAL RISKS IN TERMS OF GOVERNMENTAL POLICIES

It seems to me that there are some common elements among a large number of energy alternatives in terms of capital risk. There may be different elements as well. In the nuclear fuels area, the risks you refer to were not the risks of price or of market as much as they were risks of what is going to happen in terms of governmental policy?

Mr. ARLEDGE. That is certainly a very large aspect of the problem.

Senator MCCLURE. Can't we do more to stimulate investments in the nuclear industry by certainty of Government policy than we can by changing the financial arrangements within the industry.

Mr. ARLEDGE. It would be of great help. I still expect that it would be difficult to obtain the debt for a project like this because we have a new technology that is not proven, but what you suggest would be a great help.

Senator McClure. The same thing is true in the coal areas as well, we have governmental policies that are as much of an imposition as the financial risks that are involved or they contribute to the financial risks which are involved. I wonder if it isn't in the minds of the people in the industry, that if you get the Government involved with some of its money, maybe they will be a little more sympathetic in the regulations.

Mr. Katzin. Sir, if I may interrupt, I don't think it is really that so much because the nuclear moratorium which can determine the whole destiny of this industry is not really in the hands of Washington at the moment, but at the hands of the people in the different States. There is no way anyone can promise how the public will react to this complicated problem over the next generation.

Senator McClure. It would seem that the national policy would override local decisions. It is again a question of whether or not the Government is willing to set policies that are sufficiently certain so as to make it possible to pursue any of the alternatives we are talking to. All we have now is confusion and indecision, we can't do anything. We have whole hosts of negatives and very few positives.

Mr. Arledge. You are absolutely right.

Senator Moss. The Senator from Oklahoma.

GOVERNMENT-OWNED PLANTS LEASED TO COMPANIES

Senator Bellmon. Mr. Chairman, of all the possibilities that are listed by our witnesses, particularly by Mr. Cannon, the one that appeals to me most is the possibility of the Government owning plants, building plants, leasing them back to the companies to produce these various types of fuel, types of energy we need.

Not much has been said about it. Is there some reason this won't work? For instance, if the Government were to build the nuclear fuel enrichment plants using this new technology, wouldn't the Garrett Co. be willing to run the plant if the Government built it and owned it? Then perhaps you would have the option to buy it when you were satisfied that the technology was proven and the political situation was sufficiently stable?

Mr. Arledge. There is certainly no reason that alternative would not work. The Government owning the plant is one option you have. Obviously, we do not like it as well.

Senator Bellmon. We own the present gas diffusion plants, the only difference would be the Government would own the plants, the private sector would run it. Would this not also work for gas liquefication?

COAL GASIFICATION—ROLL-IN PRICE

Mr. Cannon. Yes, it would, sir. I would like to suggest that it disturbs me tremendously and would you if you people were to visit industries to see how many are turning to oil, as they are being curtailed of natural gas. They are daily, including Koppers Co., converting to oil to supplement this gaseous fuel. They can purchase oil at $2.25 to $2.50 per million Btu's without any tremendous capital investment. If they could buy natural gas they would use natural gas, but you know we are not finding this natural gas. What I would like to suggest is that we consider what we call a roll-in price. We can build a large industrial coal gasification plant, and as I said before, we have some 17 plants operating, we have 4 under construction at the present time, all outside the United States. So there is no risk as far as we are concerned or as far as industry is concerned. They have visited these plants, put their hands on the plants, seen them operate and they produce gas from coal.

So, there is no technology that has to be developed with our process. It is available today. We are ready to build the plants today. But if you are going to be an investor, you are not going to invest this tremendous capital cost. If you know the gas is going to cost you anywhere from $3.25 to $3.50 per million Btu's, you are going to use oil. You must have a return on your investment. This high energy cost goes into the price of your product.

So, have you ever considered the possibility of what we call a roll-in price, where industry will go ahead, they won't need the capital? Most of them have said to us that the loan guarantee is not important to them, but price support is definitely important to them. The way we can alleviate this without too much investment from the Government is to permit the gas industry to take that difference of $2.25 or $2.50 and $3.50, which is $1, and permit them to roll that difference in price, they will sell that gas to their industrial users——

USE NATURAL GAS TO SUBSIDIZE MANMADE GAS

Senator Bellmon. As a representative of a gas producing State that makes my blood boil. You are saying you want to take our gas for a third of what it is worth and subsidize the gas you are going to make so it will be competitive with oil. That just won't work. They had seven new gas wells in the western part of Oklahoma that cost $6 million apiece, producing 100 million cubic feet of gas a day as well. We can find gas and these people are not going to drill anymore until the price gets where we can afford them. You are suggesting that we use our natural gas at a low price to subsidize manmade gas at a very high price and I don't think that makes any sense at all.

What I can't understand is, if the Government feels that for political reasons they have to hold down the price of gas or oil for a time until people are willing to pay what it will cost, why can't we build the plants, why can't the Koppers Co., if it is going to cost $12.5 billion to build a plant that will manufacture 1 million barrels of oil a day, why can't we build the plants, lease them to the companies at whatever price they can afford to pay under existing market conditions and give them an option to buy the plants when the market reaches the point where it would be commercial?

Is there some reason we couldn't do that?

Mr. Cannon. There is no reason I can think of.

Senator Moss. The Senator from New Mexico.

BUILDING PLANTS VERSUS GUARANTEEING LOANS

Senator Domenici. The building of them versus guaranteeing the loans to build them, what is the difference? In one instance, we would be the appropriator of the actual money and the other we would be a guarantor.

Senator BELLMON. When you start guaranteeing loans you will get a lot of loans that will be defaulted very quickly. I think Mr. Bosworth said that when you start making guarantees then the borrowers soon lose any feeling of responsibility.

Mr. LEWAND. I would like to address myself to that. In one of the earlier comments the suggestion was made that given the guarantee, we would go willy-nilly and make loans for buggy whips. I don't disagree with the thesis throughout, it is an excellent one, but we don't think that way. In a guaranteed loan, I think a responsible organization, whether a bank or insurance company or pension fund, will insist that the criteria in the loan agreement, the covenants that protect the lender and the Government are realistic, that they do exert the kind of disciplines and, in effect, put the sponsor of the project as deeply behind it as possible before the Government steps in. I would not like it suggested that there is an absence of discipline because the guarantee is there. The arrangement has to be hammered out between the Government, the sponsors, and the lenders to insure that disciplines are in place to prevent a default from being precipitated willy-nilly or arbitrarily. You have to specify a routine that calls for specific occurrences before a default can be called.

Senator MOSS. Isn't a loan guarantee usually less than 100 percent also, so there is some incentive?

Mr. LEWAND. Yes.

DIRECT FINANCING

Mr. BOSWORTH. I want to comment. It seems to me I would remind you that Senator Bellmon's proposal of Government construction of the plants has been used before? It was used in wartime to build aluminum plants, other industrial process plants. Many of the aluminum plants the Federal Government built are still in operation today. The other thing I find more appealing about the notion of direct financing, is that one can draw a distinction between it, is in the budget or it is not in the budget, but one way or another this country has to pay that $1 billion to build that plant.

You can report it in the budget right up front, or you can say we hid it by favoring you in the capital market, which says the less competitive person in the capital market will be eased out. It is generally agreed in this country that it is the small homeowner, the small businessman, and a lot of other things in the country today that are facing strong demands for capital. If we really have a crisis about moving resources into energy should you be taking it out of other capital market uses in a very tight capital market over the next decade or should you take it out of some of the more frivolous areas in which we are presently consuming our resources? It should be out of current consumption and not out of other capital resources.

OTHER CAPITAL RESOURCES

Senator MOSS. How do you know the other capital resources are the ones that are preempted?

Mr. BOSWORTH. They are going to be ranked in the capital market. If one comes in near the top, one at the bottom has to go out.

In previous periods of tight monetary policy in the United States, when we got monetary restraints, the sectors of the economy that showed the sharp decline in activity are (1) the housing market, if you remember about 2 years ago it about collapsed, and there is a lot of empirical evidence that small loans to business are the ones that showed the largest percentage of reductions in periods of tight money. There is no reason to think that same ranking won't hold in the future.

Senator Moss. You point to housing, are there not other capital demands that have high return but from a public policy standpoint are considered less important than having alternate sources of fuel?

Mr. Bosworth. Then you pass a law saying they are not allowed to invest in those projects and they are allowed to invest in this one. This is a credit allocation system, but it could be very complicated if you pressed it too far.

LOAN GUARANTEES

Senator Bellmon. If you went in for loan guarantees, investors would put up a percentage of their own money at these plants? I can't understand why an investor would be willing to invest any money, even 10 percent in a coal liquefaction plant that will produce oil at $20 a barrel, knowing that the world price of oil is now $12 a barrel and knowing any time the Arabs choose, they can run the price up or down, OPEC can run it up or down as they want.

Why would the Koppers Co. or Exxon or anyone else put up 10 percent or any other equity in a plant to build a product that would lose money?

Mr. Lewand. I would address that to the Koppers representative.

Senator Bellmon. You are a banker. Would you loan money to Koppers?

Mr. Lewand. To build a plant that would lose money? I am not sure of that.

Senator Bellmon. I am pretty sure you wouldn't.

Mr. Lewand. It is an interesting hypothesis. It will lose money for how long?

Senator Bellmon. Until the Arabs decide to let them make money and that could be a long, long time.

Mr. Lewand. Whether or not you have a backstop in here to support it?

Senator Bellmon. Do you think you could write a venture to make it possible for the Koppers Co. to borrow 10 percent of what it would cost to build a plant that was going to lose $10 a barrel on oil?

Mr. Lewand. The degree of loss would be assessed in the context of the equity contribution that the Koppers Co. would make. It may be able to sustain a loss of that amount if the prospect of having higher returns is down the pike.

Senator Bellmon. The price of their stock is going to run down accordingly.

Mr. Lewand. It depends. The market views the investment of a Koppers or anyone else its own fashion. If they think the prognosis for a particular plant or investment is good, they will run up the price of the stock.

The presumption that it will lose money right off the bat is one that may be made by the investors and the stock will go down to the extent that investment is a major part of the capital program.

Senator BELLMON. I think we are kidding ourselves about this being attractive to the private investor. There is no way as long as the world price of oil is controlled as it is.

COAL GASIFICATION PLANTS

Senator MOSS. You were talking about gasification, where does Koppers have plants operating?

Mr. CANNON. The first plant was built in 1950 in Oulu, Finland. We have plants in Puentes, Spain, Turkey—our latest plant, the newest plant, was put onstream in Johannesburg, South Africa. We have plants in Thailand and Zambia.

This is Mr. Bumbaugh, who is also with me.

Senator MOSS. In these existing plants, have you been able to find new means of efficiency? Is the unit price, going down or not?

TECHNOLOGY HAS EXPERIENCED ADVANCES

Mr. CANNON. Yes; we have improved on the process of course in the last 25 years, so the efficiency has improved. But in every case these are countries, undeveloped countries, that do not have natural gas, they do not have oil, but they do have coal and in practically every case they do have price support—some kind of loan guarantees or price support, or support in other forms from their government.

Mr. BUMBAUGH. Mr. Cannon has covered that point, Senator Moss. In almost every instance, except the new plant in South Africa, the plants very definitely do receive some type of governmental subsidy because the focus of that plant operation is on the production of nitrogenous fertilizers. So in many cases, they don't really give a tinker's damn about the operating costs or even the environmental implications of operating such a plant. Their aim is on production. But efficiencies very definitely have increased. To cite specifically, the individual gasifier capacities of the first plant that was put into operation in 1950 in Finland, the individual gasifiers were capable of producing about 5,000 cubic feet of gas per minute; the most recent plants that have been brought into production are capable of producing some 30,000 cubic feet per minute. So the technology has, in fact, experienced advances over the last 25 years.

SYNTHETIC FUELS—GENERICALLY

Senator MOSS. That might represent some of the incentive mentioned in the discussion earlier about whether you would start right off making money or whether you had to look downstream a ways to see where you would cross the line in order to show a return.

Mr. BUMBAUGH. I want to qualify my statement. Mr. Cannon and I are here speaking with reference to synthetic fuels, more in a generic sense than we are in a specific sense with regards to Koppers.

I don't think we want to be in a position where we appear to be making salesmen-type comments. When we talk about any coal based synthetic fuels operation it should be interpreted generically. As as matter of fact, the K–T plant operation has very, very little environmental effect as opposed to some of the other available technologies, but we don't want to emphasize that.

Senator Moss. Senator Domenici.

GASIFICATION PLANT CONSIDERED IN NEW MEXICO

Senator Domenici. Let me forget nuclear for a minute because I think the nuclear discussion adds a dimension of unproven technology that perhaps is not there on synthetic production of gas from coal.

I assume you are aware, for instance, in the State of New Mexico a consortium headed by Wesco has been seriously considering a gasification plant in the Four Corners area. As I understand their proposal, they would be producing a natural gas from coal to inject in the normal interstate system that principally serves the State of California, and that is not limited to specific use, they would mix it totally with the present natural gas that comes up from Oklahoma, Texas, New Mexico, and as far as Louisiana, I assume.

As I understand it, they would be able to produce, using some aspect of the Reardon process, which I think is different than yours.

They would be able to produce natural gas—their best estimates now are up to maybe $2.75, $2.90, maybe as high as $3.

What I don't understand is, they feel they can get the price adjustment from the regulatory agency. In fact, they have every indication that such is the case.

They feel the mix is perfectly acceptable. There will be no difference in the ultimate use. You can use it in your home or in industry.

Now, it seems to me, in that instance, the only reason they are reluctant to go is that they have no assurance that there will be acceptability on the other end for a long enough period of time at let us use $3, just use that figure, and it would appear to me there are two reasons for that.

One is, they can't count on the regulatory process here at home because it is somewhat political and then they are threatened by a world market that is extremely arbitrary in terms of competition. If it is really related to crude oil or the importation of some substitute for that natural gas in those lines, then they have an extremely fragile world market.

Am I correct that is really the reason that there would not be a billion dollars investment in that area and it would need guarantees of some type?

PROJECT WOULD NEED ROLL-IN PRICE

Mr. Cannon. That is exactly correct. When I mentioned this fact of roll-in price, that is exactly what the Wesco project would need in the form of price support. They would have to go back once this $1.8 billion loan is guaranteed to build this plant at Four Corners, New Mexico, they are still going to come up with price of—our best estimate is more like $4, maybe $4.75, and they then will go back to FPC to permit them to roll that price in with their natural gas system.

Senator Domenici. You are not an advocate of deregulation or marketplace production of natural gas at this hearing because you are talking about a new way to get a lot more gas out of the conversion from coal. But is it a—what national policy is there that makes sense that would get 2½ times as much for this kind of produced gas than the kind we might find in Oklahoma, New Mexico, Louisiana, if, as a matter of fact, we are told that we can find and produce 2 or 3 times as much natural gas as a nation if the pirce was doubled? Wherein does this make sense? Is it because we are going to run out of natural gas eventually that we ought to be doing this other? Is that the answer?

Mr. CANNON. Exactly. I have to believe what the geologists say and I do not feel that with letting the gas price float, that in 10 years we are still going to have enough natural gas to supply industry.

We have to have other sources, nuclear. We are going to have to have them all, geothermal, solar, et cetera, we are going to need everything that we can put our hands on in order to keep our industry moving.

PRICE OF ENERGY

Senator DOMENICI. The one policy thing that bothers me about all of this that I would like any of you to address, if there is one thing the United States did wrong over the past 25 years in my opinion intentionally or otherwise, it was to set the price of energy too low; it had been a fictitious price.

I guess we could prepare a model and say that has been good for America because it has added some material gains to our present detriment. So we are at the detriment and want to get out of it. I would not want to be a part of a national policy on guarantees, loans or federally owned facilities that was calculated to put us right back in the muddle of fictitious energy prices and some of these approaches are more calculated to cause us to remain in a fictitious arena than others.

For instance, Senator Bellmon's notion that we ought to build them and own them. That sounds good except it would appear to me probably that we will have political pressure to keep the price as low as possible for as long as possible because we own them. Why not subsidize them. If we have $40 billion of taxpayers' dollars invested, it would appear to me the pressure to subsidize that and keep it low for a very long period of time is very real. It is a tremendous strong potential.

All Congress has to do is so will it. If you got a look at consumers across the country saying the real price plus us subsidizing at a couple of billion dollars a year, I think that is a very vulnerable posture. Which of the ones we are talking about here is most calculated to cause us to pay the real price, that is, a price with a reasonable profit and competition built in? Which one is more apt to do that?

PRICE SUPPORT—MOST DESIRABLE INCENTIVE

Mr. BUMBAUGH. I would say, Senator, given the spectrum of possible incentives available to us, to answer our question based on Koppers previous experience on industrial interfaces, it would be the price support that would be the most desirable incentive on the part of industry. Because, No. 1, we are not talking about fictitious prices regarding synthetic fuels, we are talking about very firm prices based on an awful lot of industrial experience that goes into the design and engineering of these plants. Industry seems to function best with those methods that they are most familiar with. Price incentives, in order to put the most appropriate tags on the price of the fuel, and to most appropriately tag the Government's contribution to that price, the price support program would be the one most desired by industry, because (a) in the first instance, you would produce a synthetic fuel at a given price, and then that price would be compared to, for instance, the world price of oil, and a differential could be very firmly established between the price of our domestic synthetic fuel and the world price of oil, and then the determination of a very specific differential in that case could be very easily made.

Senator BELLMON. Would you yield on that point?

If you were to establish a price support program and let's say syn gas in California was costing $3.50 and natural gas from Texas was selling for $1.60, let's say $1.50, to make it easy. Then you would have the Federal Government subsidize the New Mexico coal gasification plant to the tune of $2 an Mcf, right?

Mr. BUMBAUGH. That is right.

ESTABLISHING GAS PRICES

Senator BELLMON. Then who establishes the price of the Texas gas?

Mr. BUMBAUGH. In this case, the Texas Public Utilities Commission would establish the price of the gas there. This is where the big problem comes.

Senator BELLMON. I thought you would say the Federal Power Commission establishes.

Mr. BUMBAUGH. On interstate gas.

Senator BELLMON. If we go that route, we are back where we are now. The Federal Power Commission has been establishing gas prices for 25 years.

Mr. BUMBAUGH. The assumption is that the Federal Power Commission would be a little more realistic.

Senator BELLMON. That is a very bold assumption.

Mr. BUMBAUGH. Hopefully, that they would become more realistic in determining the price of natural gas.

Senator BELLMON. I don't see how price supports would work because that would be extremely political just as the Federal Power Commission is now.

ENERGY—SHORT AND LONG TERM PROBLEM

Senator DOMENICI. I might ask, in response to which is the best policy approach on my previous question, is there any concern that price supports would kind of preclude American technological ingenuity and alternatives from bringing that price down? Are we that certain about—I don't mean that price, but the price of a unit of energy, are we that certain that there is no alternative that is going to come onboard that is cheaper that we have then stuck ourselves with a $2.90 or $3 price support?

Mr. BUMBAUGH. The answer to that is "No": it does not preclude that. However, we have both facing us at this time, a short-term and a long-term problem regarding the availability of energy. Over the short term, and I am talking in short term 8 to 10 years, it is rather observable that only commercially available technology can be employed during that time.

On the commercially available technology, we do certainly have a price tag. We, at Koppers Co., would certainly hope that as time moves on and we move into the longer term and we are getting up to the year 2000, that technology would certainly provide us with better economies of production and we can, in fact, produce synthetic fuels from coal more economically. So we certainly won't—at Koppers Co. we are not saying that: "Let's stand pat and go with what we have now and pay the price for that." We feel that we have to move ahead immediately because the problem is that severe. And we also must move ahead very rapidly in the area of research and development to seek out more economical synthetic fuels approaches.

Senator Domenici. I have just two questions, if the chairman will permit?

Senator Moss. Go ahead.

SYNTHETICS OR ALTERNATES

Senator Domenici. At this point, the international cartel and its prices on crude oil seem to be the dictators, seem to be the thing we are all worried about because it puts the handle on both its availability and price. Are we moving toward an era when it will become less volatile because it will be tied to synthetics or alternates that are indeed much higher?

Mr. Cannon. Yes.

Senator Domenici. So as we move toward available synthetics, the competition from crude oil, as far as being the pacesetter, will become less volatile because, as a matter of fact, synthetics or alternates to what we are using now will become more and more important and more expensive; is that correct?

Mr. Bumbaugh. We would hope an equilibrium would be established. At the present time, we have absolutely no leverage on the setting of the international price of energy. As time moves on and we do, in fact, establish a synthetic fuels capability in the United States, this would be readily observed by the OPEC nations and they would see that the United States does, in fact, possess this capability of establishing a certain degree of energy self-sufficiency. And as soon as that happens, I think we would be moving toward an equilibrium.

Senator Moss. We would have some slight leverage beginning then?

Mr. Bumbaugh. That is correct.

SYNTHETIC FUELS—LONG TIME OFF

Mr. Lewand. The time, the crossover point when we find ourselves able to depend upon synthetic fuels for a major part of our hydrocarbon supply is a long time off. We are talking here not in terms of a massive industry that is going to spring up overnight. We are talking about, in effect, a series of large commercial plants that will come onstream within a term of 6 or 8 years, somewhere in that range, at which point the economics will have been thoroughly masticated and we will come up with new technologies during that period. But to suggest in this kind of discussion that such production is going to impact materially upon crude oil prices, I think is rather specious. It is not going to happen.

I will admit that the need right now as we perceive it is to start moving ahead as quickly as we can, and these issues have to be given an opportunity to prove their economic benefit or their economic cost and it matters little, in my opinion, whether this is $4 gas or $3 gas or $5 gas. I think eventually the cost of the technologies will diminish as they are improved. But the problem, of course, as Senator Bellmon has indicated, is that we have to get the Federal Power Commission, because we are talking interstate gas, to allow the cost of this gas, however it is defined, to be brought into the system on a rolled-in basis so that its price can be spread among a maximum number of consumers.

It is well understood by those who follow this industry that gas today is horribly underpriced, it is a wasting price that we have attached to gas right now, and the incremental increase, the increase in the price as the result of the roll-in of these high priced technologies is going to be minuscule in regard to the total cost of gas to the consumer.

He has the option of declining or the Congress has the option of declining to get these things onstream or seeing the price of gas skyrocket as the shortage is accentuated.

The benefits to the consumer in this case happen to be gas and happen to be a potential reduction in price because the economics of shortage are going to be deferred that much longer for him.

PRICE SUPPORT VERSUS LOAN GUARANTEES

Senator Moss. What is the difference from an inflationary impact of using price supports compared to loan guarantees?

Mr. Lewand. Price support and loan guarantees are two different things. They have to be viewed from whomever you are in the financial picture. If you are a lender the price support concept happens to be fortuitous when the plant is operating and you are looking for a reasonable margin so you can meet your debt principal and interest requirements.

If you are an interim lender or a bridge lender as the banks would be, price support is not that meaningful. We are interested in knowing the plant will be completed and we will be paid out of our bridge financing by the equity and long-term investors who come in with their long-term money.

So there are two different concepts to me.

INFLATIONARY IMPACT

Senator Moss. You can't measure the difference on general inflationary impacts?

Mr. Lewand. I am not that much of an economist. I defer to Mr. Bosworth on it.

Senator Moss. Mr. Bosworth, could you provide an answer?

Mr. Bosworth. I don't think the inflationary rate would be too great. One is going to up the demand in the capital markets, push up interest rates and by excluding some in other areas will be inflationary in the long run. They will both have about the same outcome, but will drive up the price of supplying energy one way or another.

The problem I have with these things is I think that it has been too frequently true here that you are confusing two completely separate topics. One is the desirability of whether or not you ought to pursue alternate sources of energy, and the second question, is once you have done that, what is the best way to do it?

FUTURE PRICES UNKNOWN

None of these arguments about the desirability of being self-sufficient and everything else are an argument for a loan guarantee program. They are an argument for doing something in the area of synthetic fuels. One of the serious problems is mentioned with the prices. They do not know what the future price will be, what will happen under these two programs if you give a price guarantee or a loan guarantee.

One is if the price falls from what they expected it would be they will default, they will quit, they will close down these plants. That is not exactly what you would call a good outcome in the case that the prices temporarily decline because the Arabs change their minds.

In the case of a price guarantee the project continues to operate. Other ones that I would ask if the case of these specific programs, it is not clear to me what benefits exactly are going to come from the building of a demonstration size plant. It seems very clear from the numbers that have been mentioned, these are not economical sources of energy. You could get natural gas or oil from a considerable period of time much cheaper than that.

Senator BELLMON. Where do we get it?

Mr. BOSWORTH. Oil can be found. We have by no means exhausted the drilling for oil or gas.

Senator BELLMON. Can you guarantee the Shah will let us have it after we find it?

Mr. BOSWORTH. All you can do is guarantee if the supply goes up the prices will be forced down. The notion in that case that the United States has a strong interest in finding it domestically is a false argument.

It is not even a very desirable objective. If the United States stood by itself, its trading partners can never be dependent upon their own energy and in a world in which our trading partners collapse is not a world in which we would be viable either.

What we are looking for is to increase the world supply of energy whenever and wherever it can be found and preferably not in existing OPEC countries at present.

That means you want to encourage energy supply from whatever is the most economical form of finding it. Then in certain areas, synthetic fuels are extremely risky because we don't know much about the technology. This is an argument for Government activity in the area of research and development.

COAL LIQUEFACTION

Senator BELLMON. There is nothing risky about liquefaction of coal. It is going on in 17 countries.

Mr. BOSWORTH. Now what kind of alternative supply of energy is that? What you are looking for is a process to develop.

Senator BELLMON. It is a secure supply, one we can depend on.

Mr. BOSWORTH. You can get secure supplies at lower prices by promoting R. & D. to find other processes of developing coal gasification.

Senator BELLMON. We are spending $4 billion this year for energy research and development.

Mr. BOSWORTH. Which in time, given a couple of years, you would expect to have some progress.

But what are you going to do with $30 a barrel equivalents of this gas, where is it going to be marketed, who is going to pay the subsidy price to get somebody to buy it? Here we are going to consider a loan guarantee program without answering what those questions are. It is a dangerous way to get into the issue of trying to develop such an expensive source of energy.

COAL RESERVES

Mr. CANNON. I certainly don't want to subject our energy to finding all of this gas and oil Mr. Bosworth is talking about. We know we have the coal reserves, we have more coal than the Arabs have oil, why in the world aren't we using it? I don't understand it. It is awfully risky to say we think we are going to find this gas offshore or onshore. I would say we must move forward immediately with what we have here in this country and that is coal.

OIL SHALE BEDS

Senator MOSS. We have oil shale beds out there that we know contain kerogen which if converted to oil would be more than the Arabs have of liquid oil but we are not doing anything about it. It is expensive now, yes, but we are not doing anything effective to change it.

EQUILIBRIUM REGARDING PRICE OF ENERGY

Mr. BUMBAUGH. Senator Moss, I agree with many things that Mr. Bosworth says regarding the classical economic approach. However, our continuance to rely on external sources of energy creates a fantastic vulnerability regarding the national defense position of the United States and severely aggravates our balance of trade deficit. By the installation of even demonstration plants to produce synthetic fuel we feel strongly will have a stabilizing effect on the international price of energy, and I agree with Mr. Bosworth that ultimately our goal is to find stable and reliable energy resources throughout the world. I agree with him also in the sense that probably the United States will never be totally energy independent. There will remain an international independence but the longer we put this off, the further distance that point of establishing some sort of equilibrium regarding the price of energy, we place that just further and further in the future.

Senator MOSS. The Senator from Delaware.

IMPACT UPON WORLD PRICE OF ENERGY

Senator BIDEN. If I understand it correctly, Mr. Bumbaugh, you and Mr. Lewand apparently disagree on what I just stated. In other words, Mr. Lewand, didn't you say, as a practical matter, there will be no impact upon the world price of energy or equilibrium in the foreseeable future. The whole thesis of the other argument, sir, just now was that we have to move toward establishing that equilibrium which seems to be possible in the foreseeable future.

Did I misunderstand either of your positions?

Mr. LEWAND. Let me just try again. I think the impact in the time period that we are discussing is going to be very modest, the fact that we have the technologies that are demonstrable perhaps in other areas of the world doesn't necessarily mean immediate impact upon the world price.

Senator BIDEN. Immediately, 10, 15, 25 years?

Mr. LEWAND. 10 to 15 years is a very short time frame, I will admit, but I think that to suggest that what we are talking about here today will have a major impact on world hydrocarbon prices, particularly OPEC country prices, in itself, I think that would be a——

Senator BIDEN. Even a minor impact, isn't it true?

Mr. LEWAND. I will say it will have a minor impact but I am not sure where that leads us in our conclusion. I don't say that in order to disparage the effort.

The point is, I am saying let's get on with it so whatever is contributory both to the reduction of dependency and if there is a minor impact on world hydrocarbon prices, all to the good.

FIRST GENERATION TECHNOLOGY

Senator BIDEN. The thesis of the gentleman behind you is, I thought, it would have an impact. We have to get on with it now because we have to deal with everything from balance of payments to internal security. The way to do that is to impact on the world fuel price, eventually, but the fact of the matter is I have not heard anyone suggest that there would be any such impact even in 15 years, which flies right in the fact of the argument of the gentleman behind you.

The technology that is available now, obviously is going to be superseded by more advanced technologies, second generation technologies in the near future. We are certainly talking outside of 15 years, so I am curious as to whether or not first generation technology that we have now, if we all admit it, can have no impact of any consequences upon that equilibrium Koppers refers to and we have to wait for second generation technology before that impact occurs.

Why should the Federal Government either put themselves in the position of having to pay the higher price supports of that first generation technology when the second generation comes in?

Mr. LEWAND. You won't get the second generation unless you have the first generation.

Senator BIDEN. You all just said to me and to everyone in here that we have that technology now.

COMMERCIAL GASIFICATION PLANTS

Mr. BRACY. To my knowledge, there is no commercial sized pipeline quality gasification facility anywhere, anyplace. We as lenders would not consider it to be proven on a commercial scale. He is talking about small plants, low Btu gas.

Senator BIDEN. So we don't have the technology to the degree you think is desirable now?

Mr. BUMBAUGH. In this country, Senator, there are no commercial gasification plants in this country at the present time.

Senator BIDEN. I understand. When I say "we" I mean any country doesn't have the technology now, to your satisfaction?

Mr. LEWAND. There are technologies.

Mr. BRACY. Not on the sale that we would consider.

Senator BIDEN. That is what we are talking about, the commercial scale. Does Koppers agree with that?

ECONOMIC ANALYSIS

Mr. CANNON. We agree that SNG has not been proven, but an impartial economic analysis was conducted by the largest gas company in this country, they had no vested interests in our particular process, but in studying the high Btu which we call SNG, which the Senator from New Mexico suggests, the Wesco Project, that project would cost in the relative amount of $1.5 billion—this is a process which is not commercial for SNG, they have demonstrated it at Westfield, Scotland, they can take the intermediate Btu gas and bring it up to pipeline quality gas, that is to around 900 to 1,000 Btu's per cubic foot, but the investments for one of those plants is $1,420 million, the unit investment 4.7 and the gas cost is about $4.74 by this study.

You can take a Koppers process which produces 300 Btu gas which every industry in this country can use. You don't have to take the gas all the way up to SNG, you reduce your investments by 38 percent. For $391 million we could build a plant, produce 124 billion Btu's per day, so you have lower investment cost. You have a lower unit price. Our price for 300 Btu gas is $3.34 versus $4.74 per million Btu's.

So, what we are recommending is use of 300 Btu gas in industrial application. And if you would like, I can leave with you brochures that cover what we have responded to ERDA regarding our proposal for installing plants in many industrial areas throughout the United States.[1]

For example, in West Virginia-Ohio-Pennsylvania, we are proposing to build a plant of 14 of our gasifiers which will supply 18 industries. There are steel industries, glass industry, aluminum industry which can readily use this 300 Btu gas, take them off the natural gas systems which can save this gas for domestic use.

EQUILIBRIUM IS NECESSARY FOR INDEPENDENCE

Senator BIDEN. Let me sum up the point I was trying to make. It seemed as though the position of Mr. Bosworth was taking issue with on two basic points, one, that we had to move immediately in order to move ourselves to that point of equilibrium. Equilibrium was necessary, this is Kopper's position, necessary for us to insure that we had some form of independence, that we were internally secure and we had enough energy available, and so on, and so forth. I thought Mr.

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[1] See p. 50.

Bosworth's point was that we are expending $4 billion or thereabouts in research in this field right now.

Everyone admits this first generation technology is not going to get us to the point that was just stated, as I paraphrased in Koppers' position, was not going to get us to that point of equilibrium, so why instead of making the tremendous expenditure now, do we not wait for the fruits of that $4 billion investment to find out whether or not we move on to a technology that is more advanced.

Mr. **Lewand**. When will that occur, Senator?

Senator **Biden**. I have not the slightest idea.

Mr. **Lewand**. That is our problem. I don't know when that will occur.

Senator **Biden**. If we admit what we have now will not bring us to where we want to get and will not impact on it significantly, it seems to me it is worth the risk of waiting to see whether or not it bears fruit.

Senator **Bellmon**. I don't believe we can take that admission.

Senator **Biden**. I am just raising it.

ORGANIZATIONS OFFER TO TEST TECHNOLOGIES

Mr. **Lewand**. The only way I can discuss this thing and I get pretty hot under the collar when I discuss it, if you don't talk about the need for gas or hydrocarbons or fuel in this country in terms of crisis, I think you are misleading yourself. If you don't consider this a crisis right now—and you don't have the luxury of waiting for what I rather irreverently call the Jesus factor to come in and develop second generation technologies as a result of piling on more money.

You have an offer here from responsible organizations around the country to put technologies to the test, to bring in quantities of gas that I think would be supportive of further efforts in that direction.

Senator **Bellmon**. What is your recommendation as to how we get them started?

FINANCIAL SUPPORT NEEDED

Mr. **Lewand**. We have to provide the financing to get them started and we have to provide it on the basis to induce the investor to put in his money. I am talking about an unproven technology scaled up high Btu pipeline gas, about the likely need of a Government support in the form of Government guarantee.

We need here a Government guarantee to the lender that the project will be completed and it will thereby attract the commitments, the investment dollars of the banking community, the institutional investor.

The project has to have a rating that is high enough to permit it to be sold or marketed in the institutionad markets, the insurance companies, the pension funds, maybe the savings banks. When we get to that point, I am out, the bank is out, and the insurance company is the lender. He has to be assured that his loan is going to be protected against the vagaries of price that might be inherent in a startup project of this type.

Now, how do we work them into the equation? It is a matter of hammering out negotiations. It is extremely difficult. There will be a tariff. That will have to be approved by the Federal Power Commission because without it, the financing will never occur and you have to presuppose that the tariff will provide the benefits to the lender so he can look through the tariff to the eventual purchaser of the gas.

Now, in the pipeline, the purchaser is the distributor for the most part and there is a contract between him and the pipeline which usually has in it a gas purchase adjustment clause. If the price of gas should go up, he can pass that along, and if it goes down, he has to reduce it at a later date. He has that sort of protection. He wants to be protected against force majeure and against a whole variety of imponderables that he has to hammer out in his negotiations with the Government. And given a cratering of all of these protective devices which he will work very hard to develop in his loan agreement or his indenture, then he may have to look for the Government for formal support. But, we use that in a last-resort context.

PRICE GUARANTEE MECHANISM

Mr. Ross. I would like to comment on the idea of a tariff for rolling in which is essentially a price guarantee mechanism. When we were talking about the rolled in price, that goes through the whole pipeline system and eventually ends up in your gas range or your home or perhaps industry.

Mr. Lewand. The gentlemen from Koppers are talking about one other thing. They are talking about, if I read you right, the possibility of having plants indigenous to an industrial operation in which the price is a function of the operation of that gasification plant, and the output is delivered directly to the plant, that is one of the proposals. That can allow a lower Btu type of gas and the market price will be determined upon how valuable the gas is to the consumer, that being General Motors or whoever it may be.

Ms. Ross. That was what I wanted to comment on, to make that distinction because it is something we face in the legislation. We do have bills in the House that provide for an arrangement whereby an industrial user of synthetic gas is able to contract directly with a synthetic gas producer or a pipeline to get an uninterruptable supply of that gas at a price. In other words the terms of contract between the producer of the synthetic gas and the user, probably someone who is using in the industrial process of the sort you mentioned, glass, and so forth, is that the Federal Power Commission would not be able to interrupt the supply or would not have authority over the setting of that price.

So, there would be a regulated market, but then the synthetic fuels would be able to deal outside if they could find someone to pay that price. If there were a user who found it economic to use that high price, then the user could go forward independently and have a regulatory arrangement which is there in order to try to smooth the microeconomics problems.

Now, would that arrangement suffice for the financing; and how would Koppers feel about being able to deal directly in that fashion?

PRICE RANGE

Mr. Cannon. As I explained before, the price of our gas would be in the range of maybe $3.50, so that particular industry that we are going to supply, let's say in the Ohio Valley area, can continue buying oil at $2.50. So, they are not going to contract with us to take $3.50 gas when they can continue to buy oil at $2.50 unless some way, somehow, this difference of $3.50 and $2.50 in the price can be rolled into their system of natural gas in their whole industry distribution system.

Ms. Ross. Let me make sure I understand, there was no user anywhere in the country that would be willing to pay you the price it costs you to produce synthetic gas under present technology?

Mr. Cannon. None. We spent 4 years trying to market it and in every case unless they get a return on their investment, they will not proceed forward with using our technology and our gas unless they get this return.

URANIUM ENRICHMENT

Senator Bellmon. Mr. Chairman, there is a difference between uranium enrichment and the problems we have here. The uranium processes are economic even under the present economic conditions, the only problem we have is one of legislation.

Mr. Arledge. The only people who have done it are the U.S. Government. We think our process would be economic if we can have the bridging assistance to get this industry established.

Senator Bellmon. When you say bridging, what is lacking?

Mr. Arledge. The main thing is that we cannot attract the debt to the project, so we need the Government's assurance that lenders will be protected if there is a problem with the plant. The problem is that this is a Government technology which is classified, so we have to get past that point.

Senator Bellmon. Do we need to make available a billion dollars of guaranteed loans or build a centrifuge plant the way we built the present gas centrifuge plants and let Garrett run it?

NUCLEAR FUEL ASSURANCE ACT

Mr. Arledge. I would suggest that you pass the Nuclear Fuel Assurance Act whose purpose is to turn the enrichment segments of the nuclear fuel cycle over to private industry. That is the only part of the whole cycle that is not in private hands and that is the purpose of the act. Certainly we support that.

Senator Bellmon. This doesn't involve a lot of money. It is just that it is legislation.

Mr. Arledge. It is standby dollars in case there is a problem with the technology until such time as we can refinance the project in the private markets without Government assurances.

Senator Bellmon. That is $8 billion?

Mr. Arledge. Correct.

LOAN GUARANTEE

Senator Bellmon. It is a loan guarantee.

Mr. Arledge. Not precisely a loan guarantee. It is an assurance that if there is a problem in the process, the lenders will be protected.

Senator Biden. We in the banks call that a guarantee.

Mr. Katzin. The mechanism is to transfer the plant back to the Government and then the Government takes up its operation if they need the supply and begins to service the debt as its own operating expenses.

But it isn't as though we would be selling guaranteed paper with the imprimatur of the Government on it.

Senator BELLMON. The proposal is that Garrett or some private entity would build the plant, undertake the operation of it, and if everything worked well, the technology is solid. The plant makes money then the Government never gets into it at all. If it turns out the technology is faulty or if the price the fuel sells for is inadequate, then the Government steps in.

Mr. KATZIN. The Government backup extends only through the construction period for a limited period of operation. Once it is established as a commercially viable business, the Government steps out completely and for the rest of the life of the plant, it is just an ordinary commercial operation. It is over a limited start-up period during which the Government is required.

GOVERNMENT EXPOSURE

Senator BELLMON. This $8 billion in Government contract authority, how much exposure does the Government have?

Mr. KATZIN. If we assume all four projects are built, the UEA project, Exxon, Garrett, and Centar project, the total capital cost is in the neighborhood of $8 billion. So it assumes that all four projects fail at completion. If they fail along the way and the Government takes them over and decides not to complete them because the nuclear field has changed or has been terminated, then the Government exposure is only the expenditures to that date.

Mr. ARLEDGE. We believe that if they are going to fail, they will fail in the early stages of the project.

CENTRIFUGE TECHNOLOGY

Mr. BELLMON. As I understand the centrifuge technology, you don't have to build huge plants. You can build one with a fairly small capacity and test it?

Mr. ARLEDGE. An economic size is about one-third the size of the existing diffusion plants. That is one big advantage because you can locate them around the country more reasonably.

Mr. KATZIN. It is still a billion dollars. It is small but it is a billion dollars.

COAL GASIFICATION OR LIQUEFACTION

Senator BELLMON. That is a different problem than we have with the coal gasification or liquefaction. There, the problem is no matter how successful your project is, your product will still be priced higher than what the buyers will pay. The problem is, do we need the capacity enough to pay the premium?

Mr. CANNON. I think when we have another embargo, there can't be much discussion in this room. We will move rapidly and if this does come about, there won't be any need for us to stand in line at the gas stations any longer because there just won't be any.

CONSTRUCTION TIME OF PLANTS

Senator BELLMON. We are bringing in about 8 million barrels of crude oil a day from abroad now, and this is going to go up rapidly.

If the Congress were to decide immediately that we were to somehow back Koppers or the private sector to the point where you could start constructing coal gasification or liquefaction plants tomorrow, how many years would it be before you could have a million barrels a day capacity and how much would it cost?

Mr. CANNON. From the inception of a contract to put a commercial plant onstream is about 3 years, and the size of the plant I was quoting to you where we were going to service the steel industry in the Ohio Valley would produce about 124 billion Btu's per day, so we could not build more than four of these plants, we, Koppers Co., or the industry per se, more than four of these plants in a 3-year period. That is why I say we must get moving now.

If we are going to wait for the second generation processes, which I say are 10 years away, it will take them another 10 years to build these plants and we are talking 20 years to meet this.

Senator BIDEN. How many barrels a day?

Senator BELLMON. You say 124 million Btu's per day. How many barrels of crude does that include?

ENERGY EQUIVALENCY

Mr. BUMBAUGH. Senator Bellmon, to answer your question specifically, as to how many gasification plants would be required to displace the energy equivalent of a million barrels of oil per day, as I understood your question. Let me talk about 1 million barrels per day and we will multiply that by 8. To displace the energy equivalent of a million barrels of oil per day would require about 500 K–T gasifiers, multiple-head gasifiers. That would mean we would have 25 plants that had about 20 gasifiers in each plant, and the total capital requirement for that, would be about $12.5 billion to displace the million barrels per day of oil.

Senator BELLMON. So 12.5 times 8 would give us our figure?

Mr. BUMBAUGH. So the problem is a huge one. Koppers Co. does not purport to be able to build that many plants in a short period of time nor do we expect that all of them would be K–T plants.

Senator BELLMON. How long would it take you to do that? You say you can build four plants in 3 years.

Mr. BUMBAUGH. We could have three or four plants under construction at any given time.

Senator BELLMON. Each of them having the capacity of a million barrels a day?

Mr. BUMBAUGH. No, sir. They would be a segment.

Senator BELLMON. How many million-barrel capacities could you build in 3 years?

Mr. BUMBAUGH. One-fourth of that million barrels a day, which would be approximately 250,000 barrels a day. A million-barrel capacity would probably take between 10 and 15 years.

Senator BELLMON. That is just for your company?

Mr. BUMBAUGH. That is correct, assuming all of them would be K–T, which we think is an irrational assumption.

Senator BELLMON. Do you have competitors who could build similar plants?

Mr. CANNON. Oh, yes, four or five processes are available today that are commercially proven.

Senator **Bellmon.** If we in Congress were to pass the right legislation, provide the right funding and if the industry went at it on a crash basis, within 5 years how many million-barrel capacities could we have from synthetic fuel plants?

Mr. **Bumbaugh.** That is a very difficult question to answer because we can only draw on our own experience. If you were to say in 5 years, if it were all K–T, we would probably approach one-half million barrels a day.

COST OF GAS FROM GOVERNMENT-OWNED PLANTS

Senator **Bellmon.** If the Government—assume we choose to build the plants and pay the cost of plants turning over to the industry to operate, if the Government wanted nothing back for its plants, how much per million cubic feet or per million Btu's would gas cost? In other words, if you took out the cost of the plant, how much of that is cost of plant?

Mr. **Cannon.** Absolutely no capital cost as far as industry is concerned. the Government would fund the total cost of that plant?

Senator **Bellmon.** Right.

Mr. **Cannon.** I would say the gas costs would be in the range of $1.75 to $2.

Senator **Bellmon.** That makes it fairly competitive with intrastate.

Mr. **Cannon.** That is lower than intrastate gas today. And that is lower than what you are there paying for oil today.

Mr. **Bumbaugh.** You just mentioned the very important factor, Senator Bellmon. In a gasification plant, generally speaking, given the current market price of coal at around $25 a ton, the cost of the feedstock for such a gasification plant would constitute about 40 percent of the gas cost. The remaining 60 percent would be fixed capital cost and operating costs, which can vary, plus the costs of catalysts and maintenance.

GUARANTEE PROGRAM—CROWDING OUT

Mr. **Katzin.** When the Senator is through I want to get back to the guarantee program and to reflect on something Mr. Bosworth said, the point he made that the effect of issuing a guarantee is to crowd out the smaller borrower from the market. This is on the assumption that if the Government were to build a plant, it would build it out of a current budget which was in balance.

There is little difference as far as the market is concerned, as I understand it and as I think this committee's staff report shows, whether the Government issues a guarantee and crowds out the small borrower or the Government finances directly by issuing its own bonds and crowds out the small borrower.

We have had recent experience with crowding out, but the notion that as a consequence of these guarantees the small homeowner or the small businessman is going to lose his access to the market he would otherwise have is just not the case if we are going ahead with the program one way or another.

FINITE CAPITAL MARKET

Second, I think the notion is based upon the assumption that we have a finite capital market and there is just so much money to be distributed at any one time among capital requirements. Of course, we are not always borrowing from that market at its capacity. I think today Mr. Lewand will tell you there is money available now that is not being used. Finally, it is an expanding capital market and part of that expansion results from the bringing on of major new industry in this country.

This plant of Garrett over its life will contribute revenues of some $6 billion to the gross national product, and out of that comes the expansion of the credit base, and out of that will come new savings. So it is not a matter of the guarantee crowding out the small borrower. It is much more complicated than that.

Senator **Biden**. Does Mr. Bosworth want to respond? I would be curious to know whether he disagreed with that.

FINANCING OF CAPITAL PROJECT

Mr. **Bosworth**. Certainly one is not talking about the Federal Government borrowing the money. What you are talking about is the financing of the capital project by one of the capital markets or two out of taxation. The question is that the Budget Committee sets the total expenditures of the overall budget and deficit as part of the fiscal policy.

When I say the Government finances it, I mean out of tax reducing spurious consumption figures that we would rate of low social value or it cuts back other expansion programs. It does have to keep the budget deficit exactly the same.

As to the question it would create more aggregate demand and more employment and more income; that is true. That is true of every single expenditure that is made in this economy and it is not a basis of rating one type of expenditure over any other type of expenditure. It is an argument for a more expansionary fiscal policy because you create more jobs, but it does not tell you to spend it in energy.

That is a decision you have to make looking at your priorities.

SOURCE OF ENERGY—IMPORTANT CRISIS

Senator **Domenici**. I want to make sure for the record and in particular for my good friend from Oklahoma that I am not misunderstood. I would agree with the panelists who have attempted very hard to give us a crisis attitude here today.

I believe we do have—this is a more important crisis than almost anything in my opinion short of the great recession. I don't see how we can become 60 percent dependent, although I do to some extent agree with Mr. Bosworth that there is an international question that may not be resolved by just saying we are going to become independent.

Senator **Bellmon**. I don't think there is any way we can become independent.

Senator Domenici. Let me ask this question. Is it correct to assume the major cartel countries, the major ones, are kind of single-energy countries? Is that a fair assumption? They are not involved in geothermal; they are not coal companies; they are basically crude oil and natural gas countries?

Mr. Cannon. That is correct.

Senator Domenici. If they have any wisdom or prudence in their thinking for their people, isn't it true they would be concerned about the fact they will be out of business one of these days, too, if the world continues ot use predominantly crude oil as the source of energy and if they are the major exporting source?

What do we know about their interests in investing their money in alternate sources of energy anywhere in the world? Are they now interested in investing their cartel dollars in alternate energy or what are they going to use to diversify their base and provide for their future?

URANIUM ENRICHMENT—FOREIGN COUNTRIES

Mr. Arledge. In the business of uranium enrichment we know for sure that many foreign countries are pushing this quite hard in cooperation with their governments—for example, a consortium of the French, the Spanish, the Iranians, and others have a huge plant under construction in Europe. There are several other consortia in Europe, the South Africans are pushing their technology as fast as they can, and the Japanese are as well.

Mr. Katzin. The major OPEC country we know about developing alternate supply is Iran, which is going very heavy into nuclear with a completely integrated system.

Senator Domenici. That is for their own use, isn't it?

Mr. Katzin. That is correct.

Senator Domenici. Are any of them interested in investing in future sources of energy in other countries?

Mr. Katzin. We hear of Middle Easterners looking for coal deposits in the United States, but I have not seen any transaction yet. But there is talk that some individuals from these countries are looking for supplies of fuel in other parts of the world.

Mr. Lewand. I don't think it is illogical to suggest that they may be. Certainly there has been no demonstrable effort, but in some other testimonies that I have heard in various places the suggestion has been propounded that for financing of major United States or North American projects that some Middle Eastern money might be forthcoming. So obviously there may have been some discussion among various entities. I am not too sure.

Senator Moss. We know they have been investing in other things and there is no reason to believe they wouldn't invest in this.

Mr. Lewand. They may want to maintain a control-type of posture from a long-range viewpoint. I don't know whether they have developed an OPEC philosophy on that part.

OPEC OIL AND GAS

Senator Bellmon. I don't want to jump the gun, but if you have finished, take this one step further. If it is true, and it is certainly, that the fossil-fuel resources of the OPEC nations are finite, and if we are going to one day run out of those, it seems to me we have no option but to move ahead and develop alternate fuel sources in this country. How long will the OPEC oil and gas last?

Mr. LEWAND. I think most people I have heard expressions from would say about in the year 2000 or 2010 you could see a substantial diminishment of their reserves that will be enough to telegraph the concern that they should have about this diminishing asset.

Senator BELLMON. That is 25 to 30 years from now.

Mr. LEWAND. It is hard to project out much further than that.

FOREIGN INVESTMENT IN OUR ENERGY DEVELOPMENT

Senator DOMENICI. I certainly assumed that was the state of the art. I just wonder if the world market is stable enough for us to consider the typical investor-stabilizing mechanism and that is for their dollars to be in alternate kinds of energy to a substantial degree where they have an interest in longevity and stability.

I would think we certainly should not have a policy against their investing in our energy development so long as they are only looking for a substantial return on their money. It would appear to me that if they were involved in gasification in this country in an acceptable manner to the American Government, that would be the finest kind of stabilizer in the world marketplace.

We bandy it around that we don't want them to be involved. One of those countries is looking at spending $150 billion in the next 15 years to develop their own constituents' well-being and it would seem to me you have terribly counterproductive forces working if they are a one-industry country; to wit, crude oil. They are going to get in competition with us one way or another. They are going to build plants over there to compete in other international marketplace endeavors so they are not going to run out in the year 2000 or 2010, or they are involved in an international way as they are now in future energy.

I don't think that is an answer, but it appears to me we ought to be thinking about it.

COST OF SYNTHETIC GAS FROM GOVERNMENT-FURNISHED COAL

Senator BELLMON. Mr. Cannon, if you were to build one of these K–T plants, and if the Government, we will say, were to furnish the coal to the plant at only the cost of mining the coal, how much would synthetic gas, 350 Btu quality, cost?

Mr. CANNON. It is a reduction—I gave you a price for a commercial plant of $3.34—that would reduce the price by approximately 20 percent if the coal was——

Senator BELLMON. It would still be over $2?

Mr. CANNON. Yes. What I would like to do, Koppers Co. and Columbia Gas formed a joint venture called IN-Gas Corp. We have submitted a proposal to ERDA and I would like to leave with your committee a copy, which is a brochure describing what our plans are and what we would like to do.[1]

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[1] See p. 50.

Senator Moss. Thank you. We would be pleased to receive that document.

MACROECONOMIC IMPACT OF BEING WITHOUT ENERGY

Although getting into the technology a bit, we have had a very fruitful discussion. Mr. Packer, chief economist on this committee, has been sitting on the sidelines listening. I wonder, Arnie, if you could indicate the impact that either the synthetic fuels or nuclear enrichment programs, or both, might have from a macroeconomic viewpoint.

Mr. Packer. I will try to.

One of the costs the individual investor does not look at is the macroeconomic impact of being without energy. The recession that is still not over, at times, knocked the GNP down by 15 percent. Perhaps that is a couple hundred billion dollars in a year's period.

NEEDS OF UNITED STATES AND TRADING ALLIES

If you are out of energy, then the economy slows down. However, as was pointed out, the imports are 8 million barrels a day. The problem I don't think can be looked at in terms of U.S. needs, but rather the needs of the United States and our trading allies, and therefore the vulnerability is in terms of many—well over 10 billion—barrels a day and the synthetic fuel investment early on is only a small portion of that.

So I don't believe in the short run, as was brought out, the synthetic fuel industry is going to make a substantial difference to our vulnerability of an embargo. But for the embargo, one has to look beyond OPEC to just the Arab nations within OPEC and a diversification of world oil among countries. Even if they are within OPEC, if they don't have political reasons for an embargo, this would be the best way to protect the United States from an embargo than the development of a synthetic fuel industry.

SHORT SUPPLIES MAY CAUSE CRISIS

On the other hand, as you look further out 10 to 15 years when total supplies are short, if we postpone development of alternates in the industry, and we run into a situation in which the world supplies are really short, I think you have to bring into your considerations that factor, that discussion about a crisis I think in those terms.

So while I believe it is true that you have to look at the economics of the individual project, I don't think anybody would suggest subsidizing $10 in Mcf gas or $75 a barrel oil. It is also true that if you could have assurance of producing all the gas you wanted for $2 per Mcf, even though that is above the current price, the country would be well worth spending an enormous sum of money if they could produce all the gas they wanted at $2 per Mcf.

The $100 billion figure spoken of before for bringing in the 8 million barrels a day is not shocking in that regard. That is not what we are talking about. We are talking about figures I have heard under the most ambitious synthetic fuels plants, which is a million-barrel-a-day production in the 10 years, by 1985. In terms of our imports, I don't think that is going to make a substantial amount of difference.

So I don't know whether that brings you to any conclusion. It seems to me one has to take a look at the highest reasonable price that imported oil will go to. Then you have to take a look at price guarantees and the relationship to that highest reasonable estimate.

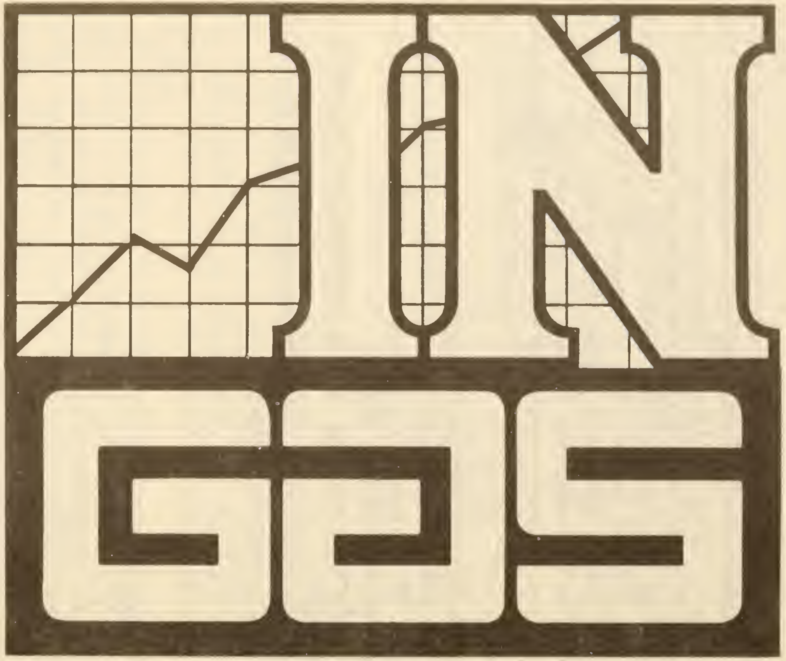
If oil is now selling for $12 a barrel, I don't know if a reasonable man would think that $20-a-barrel oil is in prospect. If it is, then it is worth something to take a risk on a process that would reduce oil at that price. If you can't produce oil by one of these methods for less than $30 a barrel, then someone would have to make a judgment that $30 a barrel oil was in the future in order to justify an investment of that kind.

Senator Moss. Thank you for your comments.

Let me thank all the witnesses for your attendance and participation in this seminar. We certainly appreciate the contribution you have made to our consideration of this matter.

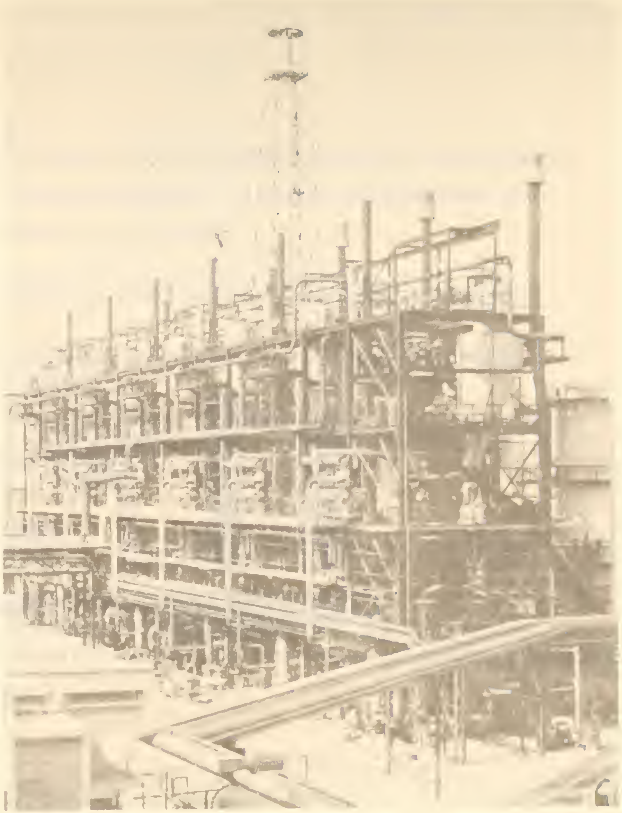
We will have a further seminar in the morning and we stand in recess until that time.

[Whereupon, at 12 o'clock noon the task force recessed, to reconvene at 9:30 a.m., Tuesday, July 27, 1976.]



Clean Industrial Gas... from COAL

A DEMONSTRATION PLANT
PROPOSAL TO
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
RFP No. E(49-18)-2043



ONE OF 17 COMMERCIAL KOPPERS-TOTZEK PLANTS ABROAD

What is the INgas project

The INgas project is a joint venture of Columbia Coal Gasification Corporation, a subsidiary of The Columbia Gas System, Inc. and Koppers Company, Inc., bringing together competence in design, construction and operations of plants for

+ natural gas
+ synthetic gas
+ coal processing

The Purpose of the INgas project

The INgas project has been formed to provide the Energy Research and Development Administration (ERDA) a project which will

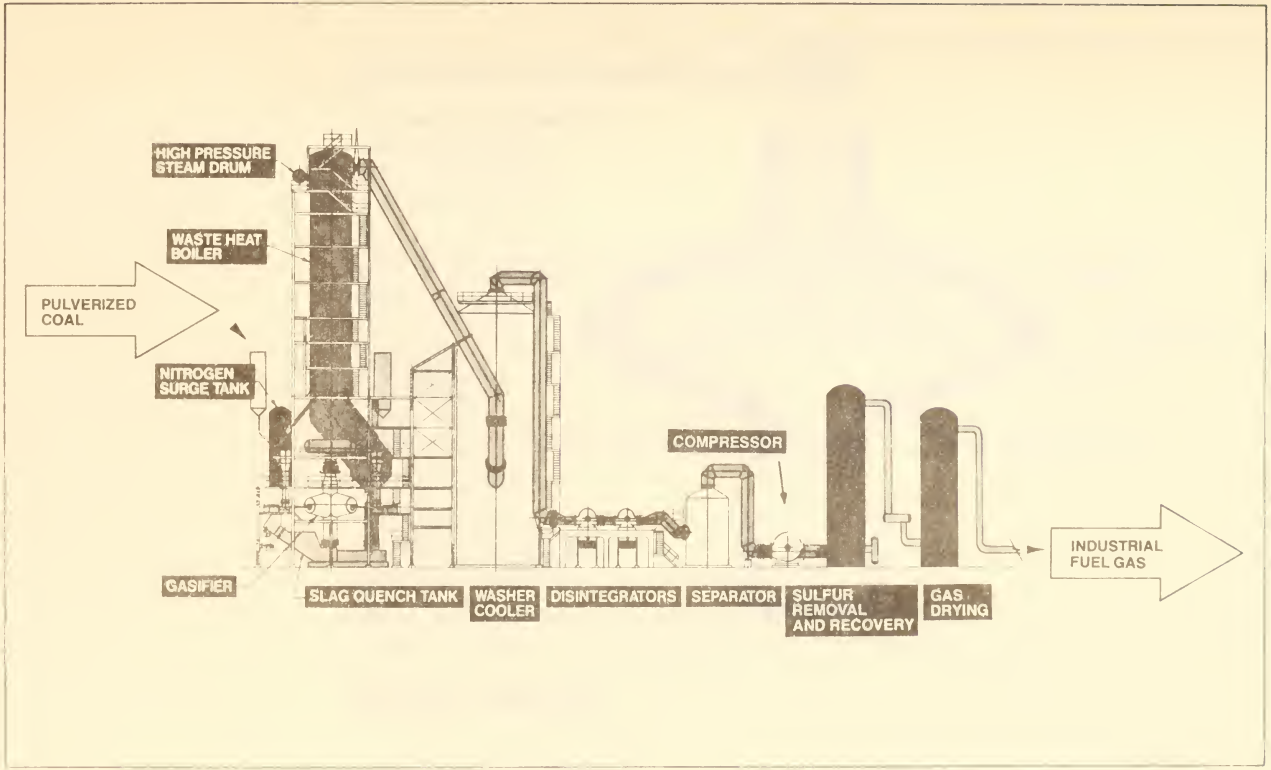
+ Determine the feasibility of initiating a coal-based synthetic fuels industry in the United States.

+ Supplement the declining supply of natural gas and oil for industry and reduce dependency on imports.

+ Make synthetic gas available for new industries.

+ Determine costs of construction and operation of a medium Btu gasification plant.

+ Demonstrate the capability of producing *clean* industrial fuel from environmentally unacceptable types of coal.



KOPPERS-TOTZEK PROCESS

PROJECT PHASES

Phase I—13 months

Conceptual design of a commercial and demonstration plant

+ technical feasibility
+ economic assessment
+ site evaluation

Phase II—25 months

Design and construction of the demonstration plant

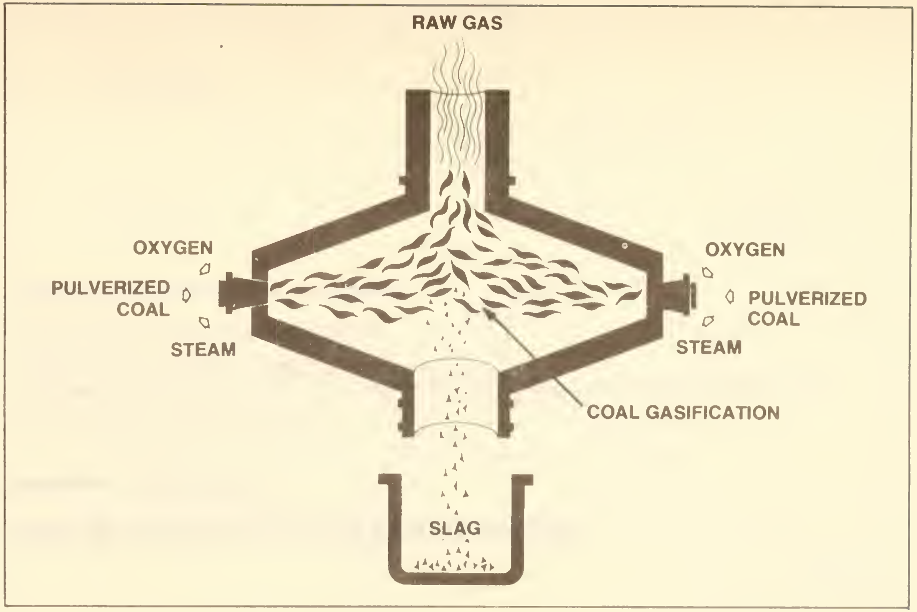
+ engineering
+ procurement
+ erection

Phase III—21 months

Operation and evaluation of the demonstration plant, leading to construction of a commercial plant

+ product utilization
+ process analysis
+ product analysis
+ economic reassessment

Total program is 55 months due to phase overlaps.



THE GASIFIER IS THE HEART OF THE PROCESS

+ Gasifies any type of coal or carbonaceous material

+ Produces no tars, oils or phenols

+ Coal feed the one moving gasifier part

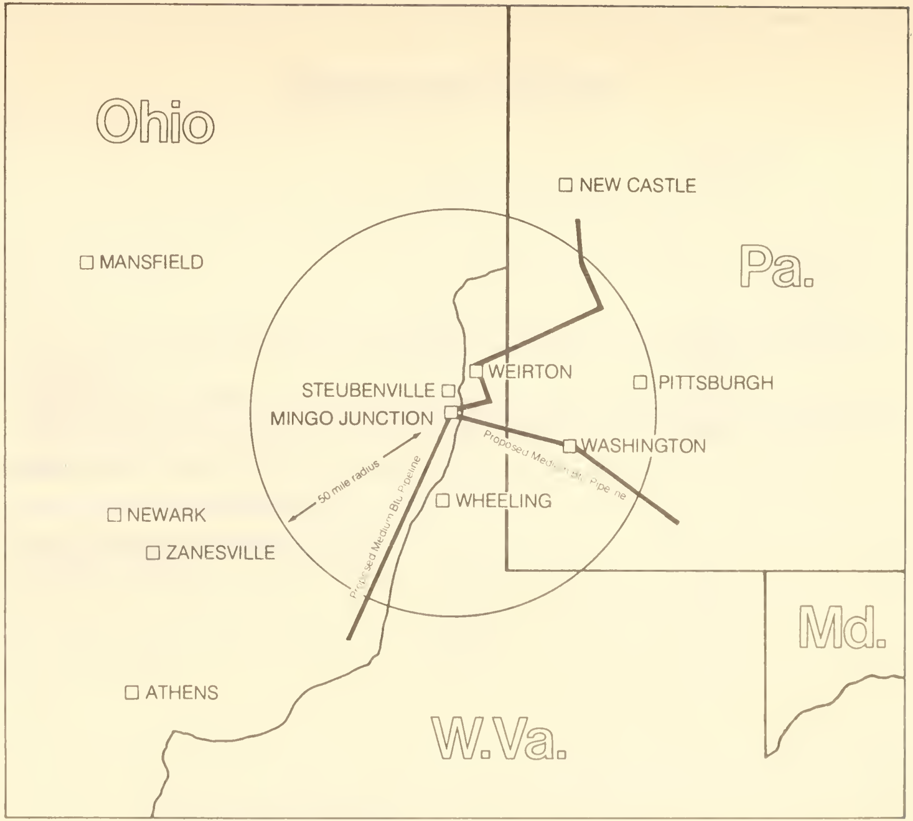
+ Saleable elemental sulfur and inert slag

+ Free of carcinogens

DEMONSTRATED RELIABLE PERFORMANCE

The Koppers-Totzek Process

+ 17 commercial plants abroad.
+ Pilot demonstration plant by U.S. Bureau of Mines, at the Louisiana, Missouri fuels experimental station in 1949
+ Composed of commercial hardware
+ Proven in commercial use for 24 years.



MINGO JUNCTION—IN THE HEART OF AN INDUSTRIAL COMPLEX

THE DEMONSTRATION PLANT

+ Plant site located at Mingo Junction, Ohio
+ Benefits provided to tri-state industrial area
+ Demonstration plant will gasify 330 tons of coal per day, producing approximately 4 billion Btu of energy per day, the equivalent of 4,000 Mcf of natural gas or 27,000 gallons of fuel oil.
+ Plant will provide clean industrial fuel for use by Wheeling-Pittsburgh Steel Company

SUMMARY OF STATISTICS

	Demonstration Plant	Commercial Concept
Koppers Gasifiers	One 2-headed	14+1 4-headed (+1 2-headed)
Location	Ohio	Tri-state area of Ohio, W. Va. & Penna.
Site Acreage	18	67
Coal Required, tons/day	330	9700
tons/year	120,000	3.5 million
20 yr. reserve, million tons	2.4	70
Industrial User	WHEELING-PITTSBURGH STEEL	13 industrials
Gas Production: Billion Btu/day or million scfd of natural gas equivalent	4	124
Btu/scf, HHV	300	300
Saleable sulfur: tons per day	8	230
Total Plant Personnel	160	260
Peak Construction Tradesmen	850	2,000
Plant Cost: millions	$55	$325

Projected Commercial Product Cost $3.50/million Btu or mcf of natural gas equivalent

THE PROJECT PARTICIPANTS

Columbia Coal Gasification Corporation

Columbia Coal Gasification Corporation is a subsidiary of the Columbia Gas System which engages in the exploration, production, transmission and distribution of natural gas. Columbia supplies the gas requirements of over 4 million customers, about 10% of the gas customers in the United States. Its service area includes parts of Ohio, Pennsylvania, West Virginia, Maryland, Virginia, Kentucky, New York and the District of Columbia.

Koppers Company, Inc.

Koppers is a large diversified manufacturing corporation with specialized engineering and construction capabilities. It has 239 manufacturing facilities and makes more than 100 types of products sold to 13 primary end markets. Koppers is the sole general U.S. licensee of the Koppers-Totzek process. Koppers engineered and constructed the first and only U.S. Koppers-Totzek coal gasification facility under sponsorship of the U.S. Bureau of Mines in 1949.

The INgas project needs your support

+ Write or contact The President, and the Administrator of the Energy Research and Development Administration expressing support of the INgas proposal in response to ERDA's Fuel Gas Demonstration Plant Program Request for Proposals—RFP No. E(49-18)-2043 in the category of Small Scale Fuel Gas Demonstration Plant.

+ Your support can help bring about the start of a coal-based synthetic fuel industry in this country and hasten the day the U.S. becomes less dependent on foreign oil.

IN GAS

Clean Industrial Gas. from COAL

COLUMBIA GAS SYSTEM

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USE OF FEDERAL FINANCIAL INCENTIVES FOR ENERGY DEVELOPMENT

TUESDAY, JULY 27, 1976

U.S. Senate,
Committee on the Budget,
Task Force on Energy,
Washington, D.C.

The task force met at 9:35 a.m., pursuant to recess, in room 357, Russell Senate Office Building, Hon. Frank E. Moss (chairman of the task force) presiding.

Present: Senators Moss, Chiles, and Bellmon.

Staff members present: Lewis J. Ashley, task force coordinator. Full committee: Arnold Packer, chief economist; Sidney L. Brown, chief counsel; and Terence Finn, Donald Campbell, Dan Twomey, and Charles McQuillen, counsel.

Opening Statement of Senator Moss

Today we continue our hearings on Federal financial incentives for energy development. Yesterday we concentrated on the use of such incentives to achieve energy development goals. This morning we want to focus on their budgetary considerations.

No issue is likely to have greater budgetary importance in the years ahead than energy. Its impact on spending, revenues, taxes and the general goals of fiscal policy are of great importance. At present expenditures for energy approximate 1 percent of the Federal budget. But the importance of energy far overshadows its relatively small part of the budget.

PRESIDENT'S ENERGY PROPOSALS

The President's energy proposals do not appear to involve a significant increase in expenditures initially—in fiscal 1977. However, they carry a significant contingent future budget liability. In addition, some of them depart from past practices.

As I indicated in yesterday's seminar, the Congress accorded a high priority on the budgeted energy items in passing the First Concurrent Budget Resolution in May. However, the President's request for off-budget financing far exceeded his on-budget proposals. For example, the administration's off-budget proposals included $100 billion for the Energy Independence Authority and $8 billion contract authority for uranium enrichment. Therefore, the budgetary implications of the President's fiscal 1977 energy proposals and how the Federal financing incentives are to be treated—on- or off-budget—are important questions that deserve careful consideration.

Federal Government spending provides centralized management of the effort, but increases budget expenditures. Off-budget arrangements present a small current budget, but do not change the Government's ultimate liability. Off-budget support may, however, reduce Federal control.

IMPORTANT ISSUES TO BE CONSIDERED

Of concern to the task force are: How should Federal incentives for energy development in the form of contingent liabilities be provided for in the budget? Are there useful general rules for budget treatment of such liabilities which apply across the range of energy financing options? How should the contingent liabilities posed by the uranium enrichment and synthetic fuels proposals now before Congress be represented on the budget for fiscal 1977 and future years? What are the likely budget outlays in future years represented by these proposals?

Yesterday we touched on some of the relative advantages of various Federal financial incentives from the standpoint of providing the best energy response. Among the consideration of interest today are the relative advantages from a budgetary perspective.

I believe the Budget Committee has a mandate to provide a clear picture as to the full budgetary impacts of the administration's fiscal 1977 energy proposals. If Congress decides to approve them, we want to be sure we understand the financial commitments that will be required to carry out such proposals. And that is a primary objective of these hearings. However, we must look beyond mere bookkeeping conventions.

We are all concerned about reducing the Federal budget. But the importance of energy to our economy and the whole future of this Nation means that we cannot afford to be penny-wise and pound-foolish. Accordingly, in reviewing the budgetary implications, we should also consider energy's role in our national priorities.

To assist us in considering these matters we are pleased to have four distinguished witnesses join us today. They are Mr. James L. Mitchell, Associate Director for Natural Resources, Energy and Science, OMB; Dr. William McCormick, Director, Office of Commercialization, ERDA; Mr. Phillip S. Hughes, Assistant Comptroller General, GAO; and Dr. Arnold Packer, the committee's chief economist.

We welcome you gentlemen. We are pleased that you are here. In keeping with our informal seminar format we have asked the participants to limit their opening comments to a brief presentation of 5 minutes or so, and that will enable us to move quickly into questions and maximize the exchange of information.

The witnesses themselves, of course, may dialog back and forth with one another when they have any difference of opinion, if that arises, and that would be very acceptable because that will add to our understanding of the problems that we have before us.

I will ask then if Mr. Mitchell and Dr. McCormick will proceed.

STATEMENT OF WILLIAM T. McCORMICK, JR.,[1] DIRECTOR, OFFICE OF COMMERCIALIZATION, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, ACCOMPANIED BY WILLIAM VOIGT, DEPUTY DIRECTOR, URANIUM RESOURCES ENRICHMENT DIVISION; AND J. L. SCHWENNESEN, ASSISTANT DIRECTOR, URANIUM RESOURCES ENRICHMENT DIVISION, ERDA

Dr. McCormick. Mr. Chairman, I have some prepared remarks which I can submit for the record, if you wish. Otherwise, I can summarize them.

Senator Moss. We would be pleased to accept the full statement for the record and ask that you present a summary this morning.

Dr. McCormick. With me today are Mr. Voigt and Mr. Schwennesen both from the Nuclear Fuel Cycle and Production Division of ERDA.

NEED FOR FEDERAL FINANCIAL INCENTIVES

I would like to talk generally about the need for financial incentives for energy development and then to go on to discuss particularly two cases which ERDA is concerned with now: Synthetic fuels development and the Nuclear Fuel Assurance Act.

Finally, I will discuss, in general, the budget treatment for those. Mr. Mitchell from OMB will be discussing some of the general aspects of the budget treatment for contingent liabilities.

In general, we have done substantial analyses, both in the area of nuclear fuel assurance and synthetic fuel development, to support, we believe, the need for some Federal financial assistance to make the transition from the technology development into the commercial application of these technologies. We believe both in the nuclear case as well as the synthetic fuel case there is a substantial need based on a leadtime problem to build plant capacity, both to serve the nuclear power industry and to replace dwindling supplies of domestic oil and gas in the case of fuel.

CAPITAL RISKS

These incentives in general are required to overcome risks that are beyond what we believe are the normal business risks. Generally, the private sector faces two kinds of risks. These are the front-end or capital risks associated with losing large amounts of capital associated with construction and initial operation of these plants.

For example, in the case of synthetic fuels these plants could be as large as $1 billion to $1.5 billion. In the case of uranium enrichment we expect the first commercial private sector diffusion plant to be on the order of $3.5 billion. So there is substantial front-end risks and these represent both potential exposure to the companies involved as well as for some companies' difficulty in obtaining the necessary capital.

PRICE RISKS

The second major kind of risk which some of these projects face are price uncertainties or price risks, and that is because of a variety of Government regulatory policies, because of the uncertainties in foreign oil prices and because of other uncertainties associated with the cost of the product. Some of these new or emerging technologies face price uncertainties.

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[1] See subsequent written questions from Senator Moss to Dr. McCormick and the responses beginning on p. 103.

REGULATED INDUSTRIES

So, generally, we have front-end risks and price risks. In the particular case of synthetic fuels the problems really can be divided into two general classes: Those facing the regulated industries and those facing the unregulated industries. In the case of the regulated industries, for example, which are interested in building synthetic natural gas projects, we have a situation where the industries are regulated to a rate of return of 15 percent. They are limited in their net worths, generally less than $1 billion, although there are several over $1 billion, and they generally finance their projects through debt financing—that is, on a 75 percent debt, 25 percent equity basis.

Historically these regulated utilities have invested in rather low-risk projects such as pipelines and so forth. Because of the dwindling supplies of domestic gas there has been a need to invest in substantially larger capital-intensive projects, some entailing much more risk than historically these companies are used to. This means a company with, say, a net worth of $1 billion may be facing a potential investment in a synthetic gas plant of $1 billion. So, in effect, without any government or any kind of assurances they will be putting the entire worth of their company at risk on one major project.

This is really a property of the era of not being able to poke a hole in the ground and producing gas. We are moving into a time where all energy development projects are going to involve substantial capital. So the problem basically then with these regulated utilities is the inability to acquire risk capital because of their limitations on rate of returns imposed by regulatory bodies.

LOAN GUARANTEES ARE MOST EFFECTIVE

For these kinds of risks we have determined through our analyses that loan guarantees 'are the most effective and the least costly Federal financial incentive to allow these regulated utilities to enter the market and acquire the necessary capital to build the first few synthetic fuel plants.

We believe it is important to assist in the first few synthetic fuel plants in order to overcome the uncertainties of these first few plants. As you know, we have never built any commercial scale synthetic fuel plants in this country, and therefore potential investors face in addition to large capital exposure, a number of uncertainties in bringing these first plants through the regulatory system.

It is going to take a substantial amount of time, we believe, to get these first few plants on-line and we believe we have to do that now in order to have the sufficient production capacity to replace the declining supplies of oil and gas that are projected for the late 1980's and 1990's.

I might point out parenthetically that even assuming rather optimistic domestic oil and gas supply conditions, that is, that we bring on supplies from Alaska and the Outer Continental Shelf, and even assuming we get deregulation and decontrol in the near future that bring on substantial new supplies, we are projecting that domestic supplies of oil and gas will again begin to decline in the late 1980's and into the 1990's.

Essentially, we have a problem to lay the groundwork to form the industry that will supply the millions of barrels a day of oil and gas in a 20-year time frame. I think the examples we have gained in the nuclear power industry where right now nuclear power is supplying only a few percent of our electric power show it will take 15 or 20 years to build an industry to grow to the levels we expect to need.

URANIUM ENRICHMENT RISKS

In the case of the Nuclear Fuel Assurance Act and uranium enrichment we have a different set of problems and risks. Here we have a situation where the Government has had a substantial amount of experience with uranium enrichment technology over the last two decades. The risks the industry faces here are risks mainly associated with the unknown technology to those industries.

We believe that the Federal Government has this technology in hand, but it is now time to move the technology out into the private sector for a variety of reasons, including the need to end, in effect, the Government monopoly and take an undertaking which has to this date been correctly in the Federal Government, but is now appropriate to move into the private sector.

Because our uncertainties regarding the technology are substantially less in the uranium enrichment area and because we have a great deal of Government experience, we see the problem as mainly a technology transfer problem and the risks perceived by industry are mainly the ones of private industry not having the experience that the Government has. So our expectation of losses in this case, or costs to the Federal Government, are quite different than in the case of synthetic fuels where there has been no commercial experience at the scale of plants we need to have.

BUDGET APPROACH—SYNTHETIC FUELS

This really leads me to the last point I would like to make in these informal remarks and that is the budget treatment for these two particular cases. In the case of synthetic fuels the budget approach is to have a contingent liability of $2 billion of loan guaranties say, for the 1st year. We believe in this case that we need approximately 25-percent coverage in budget authority; that is $500 million.

The President just last week sent up a supplemental request for $500 million in borrowing authority to cover the $2 billion in loan guarantees in the case of synthetic fuel for fiscal year 1977. The coverage ratio of 25 percent is based on our analyses of the maximum probable losses involved. Because we have essentially no experience with default ratios in the case of synthetic fuels and since we have a fairly small actuarial base where we have only a handful of plants, we believe a coverage as high as 25 percent is necessary, so we can cover at most, say, two major plants' default.

The normal coverage for loan guarantee programs is generally quite a bit less than this, on the order of 5 or 10 percent, depending on the program. This higher coverage, we think, is necessary to insure credibility in the program so that potential lenders will be able to see a reserve ratio that could cover at least, as I said, two major defaults.

The budget approach here is fully consistent with the Budget Control Act. As I said, the borrowing authority is budget authority. The loan guarantee authority would not be counted in budget totals and this is consistent with the Budget Act.

BUDGET APPROACH—NUCLEAR FUELS ASSURANCE ACT

In the case of the Nuclear Fuel Assurance Act we believe we do not need any budget authority to cover the cooperative agreements which we would enter into. The basis for this belief is the following. According to the definition of budget authority contained in the Budget Act, budget authority is defined as authority that will result in expenditures or outlays. As I mentioned before, the technology transfer problem is such that we have very high confidence that we can build and operate these plants in the private sector with no government expenditures. Since we do not expect any government expenditures, we do not believe that any budget authority will be necessary in the case of the Nuclear Fuel Assurance Act.

Mr. Chairman, this concludes my informal remarks.

Senator Moss. You said you didn't need any budget authority for uranium enrichment but isn't there contingent liability and what is the amount of that?

Dr. McCormick. The cooperative arrangements with each potential private firm which would be approved by the Congress would be $8 billion, but since we do not expect any expenditures to occur, we do not believe that this should be counted as budget authority.

Now in the case of synthetic fuels, we do reasonably expect that some defaults will occur because of the larger technical, financial, and other risks involved. So we have provided a coverage of 25 percent there.

Senator Moss. A coverage of 25 percent for synthetic fuels but nothing for nuclear?

Dr. McCormick. Yes; and the substantial difference is one of the expectations. In one case there will be Government expenditures and the expectation in the other case—that of uranium enrichment—there won't be.

PREPARED STATEMENT OF WILLIAM T. McCORMICK, JR., DIRECTOR, OFFICE OF COMMERCIALIZATION, U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Mr. Chairman and Members of the Energy Task Force:

I am pleased to be with you today to discuss the use of Federal assurances, cooperation and financial assistance as a means to help achieve our energy goals. As you know, ERDA is becoming increasingly involved in programs to encourage the private sector to finance and build major energy facilities using relative new technologies. The Congress has already authorized the Geothermal Loan Guarantee Program and action is expected soon on the Nuclear Fuel Assurance Act which would pave the way for ending the Government's uranium enrichment monopoly.

Also, we are looking forward to prompt action on legislation authorizing another, somewhat different, program which would help encourage commercial scale synthetic fuel demonstration plants.

FEDERAL FINANCIAL ASSISTANCE FOR ENERGY DEVELOPMENT

Mr. Chairman, I would like to begin by discussing the general need for certain types of Federal financial assistance for energy development and the various forms such assistance might take. As you are aware, ERDA has a rather substantial ongoing R&D effort across a range of energy supply and conservation technologies. This effort is funded directly with Federal Government funds, although in the case of some projects, on a cost-shared basis with industry. ERDA's R&D programs are designed primarily to assist industry in overcoming the technological uncertainties associated with new energy devices and these programs involve equipment scale-up from small laboratory experiments through rather substantial pilot and demonstration plants.

FINANCIAL BARRIERS

Beyond the technological uncertainties and risks, however, the private sector faces a number of other kinds of risks in the process of commercializing new energy technology. These risks, which apply differently to uranium enrichment and synthetic fuels, can be translated into a set of financial barriers constraining private sector investment. Uncertainties affecting the private sector are divided into two major categories: capital uncertainties and uncertainties connected with the rate of return on investment. More specifically, the capital constraints are related to capital availability relative to assets and the exposure of capital to risk of loss. The rate of return uncertainties are in three areas: those related to world or competing energy prices, those related to government regulations (such as pricing or environmental safety), and those related to the ultimate cost and the performance of the technology product.

Because of these financial barriers it may, under certain circumstances, be desirable for reasons of national interest for the Federal Government to share the risks associated with commercialization of some energy technologies. In the case of both synthetic fuels and uranium enrichment proposals there are serious lead-time problems associated with building the necessary capacity to ensure that the Nation can, in the first case, supplement its dwindling supply of oil and gas, and in the second case, produce adequate supplies of enriched uranium to fuel our growing nuclear electric industry. The types of Federal financial incentives best suited to accelerating the commercial introduction of a technology will differ depending on the nature of the financial barriers constraining its introduction. If the risk facing the private sector is mainly one of capital exposure or inability to obtain investment capital, then direct loans or loan guarantees are appropriate incentives to stimulate such investment. If on the other hand, the major impediment to investment is the uncertainty in competing world energy prices and therefore an uncertain rate of return, then a product price guarantee or a purchase agreement could be the most effective method of financial assistance.

SYNTHETIC FUELS—TWO MAJOR INDUSTRY STRUCTURES

In the particular case of synthetic fuels there are two major industry structures which have different risk characteristics: those industries in which the fuels are expected to be regulated, such as high Btu or pipeline quality gas from coal; and those in which the fuels will compete in the open market, such as oil produced from shale. In general, for fuels the price of which will be regulated, the rate commission of jurisdiction will normally grant a tariff which provides for recovery of all development costs that are reasonably incurred. This, in effect, means that regulated fuels automatically have an assured market with a guaranteed price. However, because of limitations on rate of return, the regulated industries have only entered into projects with minimal risk. The problem in financing a large $1 billion synthetic gas plant, for example, is obtaining the necessary debt financing which may be 75 percent of the plant cost. The difficulty arises because the net worth of these regulated utilities are only on the order of the total required debt for a single major plant. Lenders in this case are leery of such situations and these projects have not yet been able to obtain financing. In this instance, the most effective incentive appears to be a Federally guaranteed loan for the debt financed portion of the plant. Other incentives such as price guarantees and cooperative agreements can be appropriate for other synthetic fuels types depending upon the market structure and the particular risks which face the investors in these new energy technologies.

The budget requirements for this program, as contained in H.R. 12112, are $2 billion in loan guarantee authority for each of fiscal year 1977 and 1978. The President, just last week, forwarded to the Congress a supplemental request for $500 million in budget authority (borrowing authority) to cover possible loan guarantee defaults against $2 billion in guarantees in FY 1977. This "25 percent coverage" is adequate to cover our estimate of the maximum probable government outlay case. Because of the absence of previous U.S. experience in commercial synthetic fuels operations and the small "actuarial" base, it is important that sufficient borrowing authority be available to represent a credible guarantee to potential lenders.

OBJECTIVES OF THE NUCLEAR FUEL ASSURANCE ACT

I would like to turn now to uranium enrichment and the Nuclear Fuel Assurance Act. The objectives of the NFAA are to: Increase the United States capacity to produce enriched uranium to fuel domestic and foreign nuclear power plants; retain United States leadership as a world supplier of uranium enrichment services, and assure the creation, of a private competitive uranium enrichment industry in the United States and by so doing save between $10–12 billion for the four enrichment plants contemplated under the NFAA.

PROBLEMS FACING PRIVATE SECTOR ENRICHERS

The problems and risks associated with moving this technology into the private sector which make Government cooperation and assurances necessary have been extensively covered in 1974 hearings before JCAE on the future structure of the uranium enrichment industry and again covered at the 1975 JCAE hearings on the Nuclear Fuel Assurance Act (NFAA). The problems facing potential private sector enrichers, evolve from the enrichment plants: Being highly capital intensive with the ratio of plant investment to sales exceeding all other industries; not producing income for a very long time; having no private sector commercial experience with Government developed classified technology on which investors can make an independent judgement as to the commercial viability of enrichment plants, and serving an industry which itself has many uncertainties; e.g., future regulatory criteria which could force reactors to operate at reduced power, financial condition of utility customers.

TEMPORARY GOVERNMENT ASSURANCES AND COOPERATION

The proposed NFAA will help to overcome obstacles faced by private firms that wish to enter the enrichment industry by authorizing ERDA to enter into contracts providing temporary financial assurances and cooperation—for a limited period of time until full commercial operation is attained and thereafter all risks are assumed by private firms. The cooperative arrangements which will be negotiated and presented to Congress for approval will provide for the assumption by industry of the normal business risks and by Government of certain extraordinary risks associated with bringing this uranium enrichment technology into the private sector. The type of temporary Government assurances and cooperation will include:

Making Government-owned technology available to industry in exchange for royalty payments;

Assuring that the enrichment technology will work;

Selling, and providing warranties on, certain materials and equipment available only from the Government—on a full cost recovery basis;

Technology assistance—on a full cost recovery basis;

Purchasing enrichment services from private producers or selling such services to private producers from the Government stockpile to accommodate plant startup and loading problems;

Providing that as the commercial aspects of each project are demonstrated, that Government liability will be decreased until the total risk for the project is borne by the owners; and

Acquiring by the Government of domestic equity and assuming domestic debt in the highly unlikely event that a project falters—up to a limit of $8 billion for all covered projects.

With respect to this last point, we believe that the possibility of Government takeover of a project is remote. This is because the Government has worked with technology over many years and the Government will provide close oversight during the design and construction phase of each project to ensure successful "technology transfer." For these reasons, it is our view that the cooperative arrangements with Federal assurances are not expected to result in expenditures for the assumption of the assets and liabilities of private firms and therefore do not require any budget authority.

Thank you, Mr. Chairman. I will be happy to answer any question that you or the other Members of the Task Force may have.

Senator Moss. Mr. Mitchell, will you present your summary and then we will question both of you.

STATEMENT OF JAMES L. MITCHELL, ASSOCIATE DIRECTOR FOR NATURAL RESOURCES, ENERGY AND SCIENCE, OFFICE OF MANAGEMENT AND BUDGET, ACCOMPANIED BY DALE McOMBER, ASSISTANT DIRECTOR FOR BUDGET REVIEW

Mr. Mitchell. I have with me Dale McOmber, who is our Assistant Director at OMB for Budget Review and keeps our books. I thought it would be useful to have him along this morning.

I can understand why there is confusion as to how we propose to account for these various transactions. A lot of words are tossed around—appropriation, outlay, budget authority, on-budget, off-budget, and so on. Maybe a few minutes of background would help to sort that out.

BUDGET AUTHORITY

At OMB, we have a couple of chief concerns as far as how we account for transactions. One concern is that we display what is happening with the cash of the Federal Government properly. Basically our budget is a cashbox view. In any particular accounting period we try to ascertain the cash that comes in to the Treasury, either through borrowings or through tax collections or provision of service in some cases, and measure that against the outlays, the amount the various agencies spend.

We are also concerned, apart from the cash view in any fiscal accounting period, on what the future may hold by what the Congress has authorized by law that the agencies can spend. Therefore, we have a concept of budget authority.

So even if an agency is not going to expend all of its obligating authority in any year, we still have a record at any point in time of how much authority there is for that agency to reasonably be expected to use in the future.

We think that it is important for the public and the Congress to have both of those concepts in mind—how are we doing on a cash basis and what is the potential in the future for cash expenditures?

BUDGET PROCESS

A second general area we are very concerned about, especially since the passage of the Budget Act, is that of process. We have always been concerned in the executive branch that an adequate control mechanism be used for formulation of budget requests and subsequent appropriation/apportionment actions. Since the passage of the act, we have observed a considerable tightening of both of these considerations for new programs in the budget process on the Hill. For example, we are no longer faced with backdoor questions to the degree previously experienced. All expenditure proposals do go through the appropriations process, and we recognize that the Budget Committees now have a similar function to that of OMB in the executive branch, of trying to display correctly to the Members and to the public what the cash deficit or surplus anticipation is for any fiscal year and what the potential future cash outlay will be in terms of budget authority. We are concerned, of course, that these various transactions are fully reflected in that process and that all the bases are touched.

NUCLEAR FUEL ASSURANCE ACT

Let me go through our rationale as to how we propose to account for the Nuclear Fuel Assurance Act. In this case, we have taken the appropriate process steps by going through the full executive process. We have submitted the requested authority in a form consistent with the Budget Reform Act which includes language that provides for approval by affected appropriations committees of the Congress. We do not, however, foresee any future or present expenditure of Federal funds.

As Mr. McCormick has stated, this is a proven technology. The uncertainties go to basically what the Government can deliver. The Government is being obliged to transfer to the private sector know-how and technology. We have every confidence that the ERDA officials can do that and that the Government will meet its end of the bargain. That being the case, we foresee only in the remotest sense any situation where the Government could be required to make any expenditures.

Accordingly, we have not requested any budget authority since we don't see that there will be any cash outlay in the future. On the process question, we do recognize that under the new Budget Reform Act, we have got to go through the appropriations process and have assured the Congress that we would do that. The authorizing legislation that the joint committee has now reported reads that way.

SYNTHETIC FUELS

In the case of synthetic fuels, the next step to commercialization is much more difficult. The Federal Government is not the principal performer. Private industry is. Private industry is involved in an emerging technology, one that has not yet been demonstrated on a commercial scale. That is the reason for the program.

There is greater uncertainty with respect to whether the Government will have to make good on loan guarantees. In this case we have a thin actuarial base. We have never done this before. It has been estimated that about 25 percent of the guarantees could be needed in the future as Government outlays and for display purposes we think that it is appropriate that that amount be reflected as budget authority so that both the Congress and the public understand that that amount of money someday could be drawn down and spent. On the process question we have sought to get appropriation approval for all of these expenditures.

I think that is as succinct an explanation as I can make about the proposed accounting for these transactions.

Senator Moss. Thank you Mr. Mitchell.

[The following was supplied by Mr. Mitchell:]

COMPARISON OF ADMINISTRATION ENERGY FINANCIAL INCENTIVE INITIATIVES

Item	Nuclear fuel assurance	Synthetic fuels commercial demonstration	Energy independence authority
1. Purpose of program	Transfer a commercial production activity, uranium enrichment, from the U.S. Government to the private sector and thus increase the United States' uranium enrichment capacity at little or no cost to the U.S. taxpayers.	Encourage private sector to construct and operate "first-of-a-kind" commercial-scale synthetic fuel plants in order to gain early information and to initiate development of synthetic fuels industry infrastructure.	EIA will supplement and encourage private capital investment and facilitate Federal regulatory clearance in meeting the Nation's needs for energy resource development and conservation.
2. Scope of program	Cooperation and temporary financial assurances limited to 1 gaseous diffusion plant and 3 centrifuge plants.	Financial assurances limited to the commercial demonstration of: Synthetic fuels from coal, oil shale, biomass, renewable and other domestic sources. Energy efficient industrial equipment and facilities.	Financial assistance limited to: Commercialization of emerging energy technologies not yet in widespread commercial operation to support, produce directly, transport, or conserve energy. Conventional energy technologies for production and transmission of electric power generated by sources other than oil and gas. Conventional energy technologies for the production or transportation of energy of such size or scope that they would not otherwise be financed by the private sector.
3. Need for Federal incentives	To decrease constraints to private sector investments, including: Lack of private sector experience with classified, Government-developed technology and private investor interest in funding projects based on such technology (in the face of other investment opportunities). Extremely large size of each enrichment plant, about $3,500,000,000 for the diffusion plant. Long period before any return on investment.	To overcome the following constraints to private sector investment: Synthetic oil—Except for the very largest firms (major oil companies), capital availability is a substantial barrier. Risk to capital or an inadequate or uncertain return on investment is a major concern for all potential producers. Synthetic natural gas—All producers would be subject to price regulation by the FPC. Accordingly, the ability to pass production costs through to consumers mitigates the constraint of return on investment. However, capital availability exposure are significant barriers to investment. Utility fuels—Synthetic utility fuels may in many cases cost more than the fuels they displace and the required electric rate increases present potential problems for regulatory approval of such projects. Capital availability is a significant problem. Industrial fuels—Capital availability and exposure are major barriers to all except the very largest of those producers. Risk of inadequate return or profitability is also a constraint.	Energy supply investments in the United States will be about $580,000,000,000 (in 1975 dollars) over the next 10 yr. Some of the most promising sources of energy require considerable investments and involve substantial risks. Projects such as synthetic fuel plants, energy parks, coal slurry pipelines may be too large or technologically risky to secure private financing. Regulatory and technical uncertainties combined with long-lead times associated with large-scale construction projects, present risks which deter private investment. Without Government participation, many projects which would produce substantial amounts of energy may not be initiated.

4. Type of financial incentive proposed and conditions attached.	Warranting that the Government-developed technologies used by the private sector will work. Provides authority to assume the domestic assets and liabilities of a project in the rare event that a project were to falter.	Loan guarantees—Amount limited to no more than 75 percent of project cost at completion.	EIA could provide financing in various forms including direct loans, loan guarantees, guarantees of price, purchase and leaseback of facilities, and the purchase of convertible or equity securities. It is anticipated, however, that the bulk of the authority would be in the form of loans and loan guarantees.
5. Type and total amount of authorization sought.	Authority to enter into contracts which would permit ERDA to incur contingent liabilities on the U.S. Government up to a limit of $8,000,000,000 to cover the remote event of a failure of a private enrichment firm.	$6,000,000,000 (loan guarantees); $2,000,000,000 to be provided in fiscal year 1977, the remainder in EIA. H.R. 12112 provides $4,000,000,000 divided into $2,000,000,000 in fiscal year 1977 and $2,000,000,000 in fiscal year 1978.	$100,000,000,000 (off-budget): $75,000,000,000 in borrowing authority. $25,000,000,000 in capital stock.
6. Type of appropriation requested (authority to incur obligations):			
(a) Appropriation language	An appropriation language change for ERDA will be requested which sets an upper limit on the liabilities, $8,000,000,000, which can be incurred under NFAA.	None	None.
(b) Appropriations:			
Fiscal year 1977 request	None	$9,000 000 administrative expense	$8,000,000,000 (off-budget) as capital stock purchased by Treasury; $42,000,000 (on-budget).
Total program	None	Appropriations would be requested later should defaults occur to repay any borrowings from Treasury.	$25,000,000,000 (off-budget); on-budget not estimated.
(c) Borrowing authority (authority to spend debt receipts)—Total program.	None	$500,000,000 in authority to borrow from the Treasury to cover possible defaults under $2,000,000,000 in loan guarantees. Generally, 25 percent of peak estimated loan guarantees would be provided as borrowing authority. Approval subject to Appropriation Committee action which is consistent with Budget Reform Act.	$75,000,000,000 (off-budget).
7. Budget outlays:			
Fiscal year 1977 request	None	None (excluding amdinistrative expense and fees)	$42,000,000 (on-budget); $650,000,000 (off-budget).
Total program	None (ERDA will estimate any potential outlays and display them in the years they will occur).	$486,000,000 (over 30 yr, assuming 2 defaults)	Estimate not available.
8. Payments for defaults	ERDA borrows from the Treasury to assume the domestic assets and liabilities of a project and decides if it will complete the project.	ERDA pays immediately and takes possession of project assets. Payments from borrowing authority via a revolving fund.	EIA obligations "shall be fully and unconditionally guaranteed as to principal and interest and shall constitute general obligations of the United States backed by the full faith and credit of the Government. . . ."
9. Other congressional actions—Total program.	Each contract with a private enrichment firm will be submitted for congressional approval.	None	None.
10. Administrative costs	All costs for administration of this program will be borne by private enrichment projects.	$9,000,000 per year and approximately 100 employees. Part of costs deferred by 1-percent service charge.	Staff will grow to 600 employees in fiscal year 1977 Operating costs in EIA's initial years are estimated at $35-$10,000,000.

Senator Moss. This different treatment of nuclear and synthetic fuels is a matter we are concerned about. We had considerable discussion about it yesterday. However, prior to questioning you I will ask Miss Ross of the committee, staff to highlight yesterdays seminar as it relates to todays subject matter. This will facilitate the transition and enable all of us to be on common ground.

Ms. Ross. Thank you, Senator.

STATEMENT OF HEATHER ROSS, SENIOR ECONOMIST, COMMITTEE STAFF

LOAN GUARANTEES OR COOPERATIVE ARRANGEMENTS

The key question that we are looking at today is how to deal in the budget process with these liabilities that the Government assumes under loan price guarantees in the case of synthetic fuels or under the cooperative arrangements in the case of uranium enrichment.

The committee must decide this treatment and make provision of funds should it choose to do so in the Second Concurrent Resolution for fiscal year 1977, which it will be beginning work on next month.

Now, it is in the nature of risks that you should expect when you assume it, that there is some chance that you are going to have to come through and pay out. So it is hard to say that zero is the best number, that is, you are firmly convinced that nothing will happen. In that event you have to ask why the Government guarantee, and that is part of what we discussed yesterday.

On the other hand, I think it is also true you would not expect the maximum exposure to spend out. If you really thought that you would not promise a guarantee program, it would be something very different. But somewhere in between there is some likely outlay of Federal funds which we are committing ourselves to even though we can't know it with certainty.

That is important, that it is uncertain. But in order to carry out the priority setting function that the committee has taken on and to look out into future years rather than just focus on this current year, it is particularly important for the Budget Committee to try to get a handle on that.

I think it is worth pointing out that this isn't different in kind from what the committee tries to do regularly with its 5-year projections, trying to anticipate the effect on the economy and what the economic picture will be out into the considerable future and also to try to estimate outlays under the entitlement programs which are quite uncertain, and the committee deals with that all the time.

OUTLAY DEPENDS ON RISK

Now as has been talked about here, the outlay depends on the risk being assumed and that is what we got a good feeling for yesterday, I think, in the testimony we had. We had witnesses from industry and from investment banking that helped us get their views of that.

In the case of synthetic fuels there was general agreement that the cost of production would be high enough to exceed any reasonable likely price; and therefore, some subsidy would be required to have these plants go forward.

In regulated markets, this could come from the FPC decision—a regulatory decision that would allow a role in high-priced synthetic gas and that would be a guaranteed market and price right there. But in the unregulated markets, the subsidy would have to come somehow more directly from the Government.

GOVERNMENT ASSISTANCE IS ESSENTIAL

We had a witness from the Koppers Co. The company has an unregulated low-Btu gasification process which it has been trying to sell in this country without success so far. Mr. Cannon, the man from Koppers, indicated that the Government assistance would be essential for that and what they were looking for preferably was price guarantees, which he would expect they would receive value from over the life of the plant.

So it appears that at least in the case of certain synthetic fuel producers that a stream of payments would be necessary to get these plants up and to keep them operating and certainly if the Congress were to proceed with this program, it would want to make allowance so the plant could get up and could operate successfully.

The budget question then is how much and with what kind of profit, and that is what Mr. McCormick was speaking to in his calculations today. In the case of uranium enrichment the industry representative from Garrett Corp. indicated that private ventures were expected to be economically successful. He expected they would have a successful operation, but they could not go forward without Government backing.

Now the backing was not strictly a technology transfer as has been discussed here this morning. There in a centrifuge process, which is a new process, not the existing Government process which is the diffusion process, he felt that was an untried process and that there were uncertainties about that technology.

GOVERNMENT'S REGULATORY ACTIONS

He also felt that there were uncertainties about the Government's own regulatory actions which were of a major concern to any financial backing, that is, the Government might say that they could not sell for a nonproliferation reason and could limit the market or the Government would have a new set of safety standards or some kind of decision that might involve them taking the plant back ultimately, that there was a question about safety standards and nonproliferation standards that would indicate that the Government might choose up to a moratorium some major action that would cause them to lose their investment.

So that was a risk they didn't discount and didn't think was zero. So even though perhaps a major part of the risk is Government action that may be taken by the Congress later on, it would seem from the testimony yesterday there is some risk that the Government would be undertaking and having some idea, even though that is highly uncertain what it would be in getting an estimate of it. However uncertain it might be and however small it might be, is something we are trying to get a grip on today.

These are very complicated questions that we have asked the witnesses to address, and I think that we need to bring all resources to bear on it we can. It is quite unprecedented.

I would like to point out the Budget Committee has had the benefit on these two issue papers that were prepared by the Congressional Budget Office on uranium enrichment and on synthetic fuels, and there is also a new paper that they have just released this week on energy financing which is right at the heart of what we are discussing today.

There are copies of those papers located near the doorway. As I say, it is a subject that focuses on what we are doing. The authors of those reports, David Montgomery, Richard Dowd from the Congressional Budget Office, are here as are members of the Senate committee staff. Sidney Brown will be here and Don Campbell and Terence Finn are here. They will be able to assist in addition to the witness any questions of fact in the discussion about the bills or about budget concepts.

Senator Moss. Thank you, Ms. Ross, for your summary.

SYNTHETIC FUEL PLANTS

Mr. McCormick, I understand that ERDA's plan is to build 7 to 12 synthetic fuel plants to produce an equivalent of about 350,000 barrels of oil per day. Wouldn't fewer plants enable us to prove the approach and provide adequate information for decision and perhaps save considerable money.

Dr. McCormick. Mr. Chairman, we have looked in some depth at what size plants we need to demonstrate commercial viability and that is exactly what we are trying to do here, demonstrate from a technical, economic, environmental, and regulatory, institutional, and what have you. In order to get the information that we think is necessary, we don't believe that you can test the Mack Truck with the Volkswagen. For example, in order to convince the financial institutions that these projects are commercially viable, they have to be of a size where they can, in fact, produce the fuel in quantities large enough to demonstrate that commercial viability. They have to produce the pollutants at a large enough scale. And they have to have the institutional and regulatory reviews that would be substantially the same as a commercial enterprise would undertake.

So what we are trying to do is to simulate the real commercial experience and we don't think you can do that with a small plant. So, we think you need a plant on the order of 25 to 50 thousand barrels-per-day equivalent to demonstrate that viability. We have done some analysis of the question of how big the plant needs to be, and we would be happy to provide the task force with that analysis. We think there is a strong case.

Senator Moss. Do you need multiple numbers of plants, 7 to 12?

Dr. McCormick. What we are attempting to demonstrate is a variety of synthetic fuel technologies and products. For example, we want to demonstrate the high Btu or pipeline quality gas that could be mixed in interstate pipeline. We want to demonstrate the viability of shale oil products. We want to look, as Ms. Ross said, at the unregulated industrial fuel market that would supply industry as well as electric utilities, and we want to look at the conversion of various kinds of wastes into synthetic fuels.

So, when you have the requirements of five or six major resources and fuels, and several different approaches, when you add up the minimum number, we believe you need to look at the various resources, eastern coal, western coal, so forth, you get in the range of 12 to 15 commercial scale plants.

TWENTY-FIVE PERCENT OF BUDGET AUTHORITY

Senator Moss. How do you reach the figure of 25 percent of budget authority? What is the significance of this figure? Why not more or less?

Dr. McCormick. The way we did that was to look at the investment required and the total amount of guarantees that would be required for the program, and then estimate how many defaults we would expect in a maximum type of case. We know that it would be imprudent to suggest that none of them would default.

On the other hand, we have enough confidence in some of these technologies that we expect most of them to work. Admittedly we don't have a hard and fast rationale simply because there is nobody of experience or information to suggest that 10 percent is the right number or 20 percent is the right number, and so forth. We know that, historically, loan guarantee programs have had small coverage rates, 5 or 10 percent. We believe that is inadequate in this case because of the first of a kind nature of each of these ventures. So, we sized the percentage based on two major plant defaults, which is about a quarter of the larger scale plants we expect to build. I think this is large enough and creditable enough to the financial institutions that they will be willing to lend money on that basis of reserves.

FEDERAL GUARANTEE

Senator Moss. Is the Federal guarantee to be for the total cost or is it only guaranteeing part of that capital?

Dr. McCormick. According to the proposed legislation, which is now pending on the House side and the legislation that was before the Senate last year, the maximum amount of guarantee would be 75 percent of the total estimated cost of the project. The guarantee could be for 75 percent.

So, in other words, 25 percent would have to be financed with the equity financing of the company.

Mr. Mitchell. From the point of view of the private purchaser of these securities, he wants to know that he is fully covered should there be a default. He could care less whether it is 25 percent or 100 percent. We think that the legislation proposed provides that assurances in both of these programs and that is an absolute essential. Either you have a guarantee or you don't and the reason you do it is to sell the securities more easily.

If you are at the other end of the tunnel trying to figure out how much cash you are going to need to cover estimated defaults, a totally different question is raised. It is easy to mix up whose perception you are talking about. From the perception of the investor, he wants a 100 percent guarantee or he wants to know that he is fully covered. From the perception of the Government it is a different question because we are talking about budget authority and trying to estimate the amount of cash we may need to cover defaults in the future.

I think that these two cases illustrate this point. In the case of the NFA proposal we don't think any cash is going to be needed. In the case of synthetic fuels our best estimate at the present time is that 25 percent of the loan guarantee authorization cash may be needed.

If there is any change in these estimates we will have to come up to the Hill and ask for additional budget authority and appropriations to liquidate that liability.

Basically, the question on budget authority, at least in our view, is one of estimating prospectively how much cash you are going to need to liquidate should defaults occur.

PRICE SUBSIDY

Senator Moss. Does this budget authority also include any price subsidy of the product?

Dr. McCormick. The administration requested budget authority does not. It is based on $2 billion of loan guarantee authority which would cover the initial development of this program in ERDA. It corresponds to the House version of the bill that was introduced by Chairman Teague.

Since the original administration proposal of synthetic fuels, there has been a good deal of debate on this subject both in the Senate and the House and there are several different versions of this bill now pending in the House. It has gone through four different committees. There is one the Banking Committee version, which does not have $4 billion of loan guarantees for 2 years, it has $3.5 billion of loan guarantees and $0.5 billion of price guarantees.

Senator Moss. The Koppers' witness yesterday indicated that they could not now produce a synthetic gas at any price that would be competitive with natural gas at current prices and therefore some kind kind of subsidy would be required.

FUEL PRICES

Dr. McCormick. I think that illustrates the peculiar nature of the leadtime problem that we have. The thing I have to keep reminding myself is we have to look at the price of these fuels as they will compete when they come online in quantity 10 to 15 to 20 years from now, not at the price today.

For example, in the case of high Btu pipeline gas, we estimated that it will be about $3.25 or $3.50 per million Btu. That is not competitive today with regulated natural gas, it is not even competitive with intrastate gas which is a little less than $2. But looking at the problems which the gas utilities have in the next 10 to 15 years, they are looking beyond to Alaska gas, to imported liquefied natural gas which will be in excess of $3, and they are even gasifying a petroleum product, naptha, today, at a cost of between $4 and $5.50 a million Btu's.

So you will have to look at what these products will be competing against, these synthetic products, when they come on line 10 or 15 years from now. Our expectation is the price of the natural products 15 years from now will be substantially higher than they are today, due mainly to the depletion factor.

TIME REQUIRED TO BUILD PLANTS

Senator Moss. Are you saying, it may take 10 to 15 years to develop this capability in considerable volume, but it only requires about 3 years to build a plant.

Dr. McCormick. I would say that is a little bit on the optimistic side, and I would say it would be 5 years to get it up and that is the reason that there are such financial perils in building one of those plants today simply because the first few plants are not likely to be very competitive if they are not subsidized or assisted. That is precisely why we are suggesting the need for some of these various kinds of guarantees.

Senator Moss. One of yesterday's witnesses, Mr. Cannon, of Koppers, indicated they have a number of gasification plants—12 of them I believe—in various other countries although none in the United States. These plants are operating now. Thus, presumably, we have good data on construction time and how much it costs to convert coal into gas.

We are confronted with an energy problem. If you say it takes 5 years to build the plants and 15 years to be producing on a commercial scale something has to sustain the plant during that critical interval, does it not?

LOAN GUARANTEE—MOST EFFICIENT DEVICE

Dr. McCormick. We do agree with that. That is why in our original set of proposals, we envisioned in some very limited selected cases the need for some price guarantees in the case of fuels competing in unregulated markets.

Except for that one special case, we think that the loan guarantee is the most efficient device. But, we would agree in some cases there may be a need for price guarantees.

Senator Moss. Senator Bellmon?

Senator Bellmon. You opt for the loan guarantee. Have you considered a program under which the Federal Government would simply build the plants and then lease them to the operators, sir?

Dr. McCormick. Yes; we have. As a matter of fact, we considered a number of other approaches but in coming up with a recommendation for loan guarantees, we felt it was best for the following reasons:

No. 1, if the plants worked and were successful, it would not entail any Government expenditures.

No. 2, we expect that——

Senator Bellmon. The same could be said if you built plants and gave the companies an option to buy them.

Dr. McCormick. If, in fact, they worked and the companies purchased them, that is true. Of course, in the case in which the Government built them, the Government would carry the full liability, the full burden of risk.

Senator BELLMON. I think that is the thing this committee is concerned about, we feel we are going to be carrying the risk anyway, because gas is now selling for 52 cents interstate, and if it goes to $1.40, and it costs $3.40 to make it, the plants are going to be worthless.

Dr. MCCORMICK. The risk the Government would have and the risk the industry would have on these plants is defined. The proposed authorizing legislation provides a limit of Government liability to 75 percent of the total costs of the project.

Senator BELLMON. We had testimony yesterday from Mr. Cannon, of Koppers, that his company would not invest 1 percent, not a penny in these plants because they know they are not going to make any money with them.

GAS PROJECTS

Dr. MCCORMICK. There are two different kinds of gas projects. One is in a regulated environment producing high Btu pipeline gas and the other is the industrial gas. The latter is the one the Koppers Co. is concerned with. In the case of the former, the high Btu pipeline gas there are at least 8 major projects in this country with about 10 major gas utilities that are interested in building one of these plants tomorrow if they have the financial assistance. There has been a great deal of testimony by those companies and financial institutions supporting their desire and need to have one of these plants.

Their problem is mainly in obtaining the debt financing. They are willing to put 25 percent of their total cost of the project. In other words, $250 million of equity at risk to build one of these plants.

Senator BELLMON. Could you give us a list of those companies?

Dr. MCCORMICK. Yes; we can. There is a listing in the factbook of those projects. It is tab "I." [1] The five projects furthest along in the high Btu gas area are listed in the middle of the page, the American Natural Gas project in North Dakota, the El Paso in New Mexico, the panhandle eastern and western coal gasification project.

Senator BELLMON. These projects will go forward if a 25-percent loan guarantee is provided?

Dr. MCCORMICK. Yes. The Federal Power Commission has provided a tariff on the *Wesco* case, initially a year ago, $2.50 a million Btu based on the costs estimates then with the provisions they could come back and request additional tariff relief in the event they incur costs that are considered reasonable by the Commission.

The purchasers of the gas of this particular project are in southern California, and in that particular area they have such a drastic gas supply situation that they are projecting curtailments of domestic users in 3 years. So they are eager to get this project on line and they are willing to pay the price of this gas which will undoubtedly be in excess of $3 a million Btu.

SHALE OIL PLANTS

Senator BELLMON. Could you give us similar information about the other types of plants you have listed here, shale oil, and industrial fuels? Will the shale oil plants be economically feasible with the 25-percent guarantee also?

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[1] See p. 154.

Dr. McCormick. In the case of shale oil, the proposed legislation provided two options. One, a loan guarantee and the other, a cooperative cost-sharing agreement.

There has been a variety of different proposals by the potential shale oil sponsors. The reason for this is because the structure of the projects and the companies are different. In the case of some of the smaller companies, and I say this in a relative sense, they have suggested the need for loan guarantees so that they can obtain the debt financing available. In the case of two major projects, it is our current understanding that they would go forward with the 75-percent loan guarantee.

Other projects suggest the need, perhaps, for a cooperative agreement of some kind.

Senator Bellmon. Which of the two projects would go ahead with the 25-percent loan guarantee?

Dr. McCormick. I hesitate to give you those names right now, Senator, because the companies have indicated a desire not to have their negotiating positions made public. I would say generally that is true for all of them.

Senator Bellmon. I don't believe this committee is going to be willing to buy a pig in a poke, as they say. If we are going to get this, thinking we are going to have 25-percent exposure and find out, as the Koppers' people led us to believe yesterday, that the exposure will be more like 100 percent, the committee is going to be very careful before we approach such a procedure.

Dr. McCormick. There are, of course, several checkpoints at which the Congress has an opportunity, in both of these pieces of legislation, to review the specific proposals. Each of these major projects would lie before the Congress and there would be an opportunity to examine them in detail.

We think with the risks that are involved in the case of the synthetic fuels projects, they are fairly well defined in terms of the proposed legislation. There is a maximum limit on liability. There is a maximum term of the liability, and there are provisions for the Government to remove itself in the event that there is no longer a need for Government guarantees.

COST ESTIMATES ON MAKING OIL FROM SHALE

Senator Bellmon. According to ERDA's calculations, Mr. McCormick, what will it cost to make a barrel of oil from shale?

Dr. McCormick. We estimate $14 to $15 a barrel in today's dollars.

Senator Bellmon. The information I get from my sources is it would be more like $20 to $25 a barrel.

Dr. McCormick. We have some estimates in tab "J" of this factbook.[1] There is an estimate for shale oil which is probably the best one to look at for this purpose. Exhibit "B" of tab "J" shows on the left column there the estimates without incentives. We estimate $14.50 per barrel. The Union Oil Co. estimates this could be as low as $13.75. We have an estimate from the Oil Shale Corp. of $18.90.

The $14.50's are our own independent estimates based on our cost calculations.

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[1] See p. 158.

Senator BELLMON. This is with current economics or in 5 years?

Dr. MCCORMICK. That was done in the early part of 1976 in 1976 dollars.

I might point out the last page of that tab has a chart which might be able to explain the differences in some of the numbers that people throw around. What it shows is the dollar-per-barrel cost as a function of the discounted cash flow rate of return. What it shows is, not surprisingly, that a cost of a barrel of oil will depend on and is quite sensitive to the rate of return.

So, depending on the debt equity ratio, depending on the rate of return and a number of other things, you can get a variety of different numbers. But our most general estimate that we use for a 50-percent return is $14.50 a barrel for oil shale.

There are companies that believe that they can make that. One of the major risks they face in doing that is, of course, building a large billion-dollar plant not knowing what the world oil price is going to be over the next 5 or 10 years because it will mainly be established by cartel pricing policies and not supply/demand relationships.

FIRST AND SECOND GENERATION TECHNOLOGY

Senator MOSS. We had some discussion yesterday about the first and second generation technology. Is this an argument for cutting down on the original obligation or do you still think we need the number of plants in the amounts you suggested?

Dr. MCCORMICK. Mr. Chairman, there has been a lot of confusion on this first generation, second generation technology. The best way to understand it really is that first generation technology is available technology. That is the technology that you can go out today and build one of these plants with. The second generation technology is the technology that is on the drawing boards, it is in the research phases at ERDA right now. There is going to be no opportunity to build second generation technology at commercial scale in the next 5 or 10 years.

ERDA has just entered into an agreement to build its first demonstration plants for a second generation technology which is only going to be a fifth of commercial scale and that won't be constructed until 1983, 7 years from now.

So, when we talk about getting any kind of synthetic fuels going commercially in the near future, there is only one way to do that and that is with the technology we have today.

Now someone may suggest why do you go ahead and build the first generation technology when you have this new stuff in the pipeline that is coming along. The reason for that is that the technologies are similar enough and the kind of information you can gain from going out and building a first generation gasification plant is worthwhile.

In other words, the information is directly transferred to the second generation technology, which has to go through the same regulatory barriers, the same environmental problems and the same financing problems. So building a first generation technology is going to be very useful to speeding the commercialization of second generation technology.

BUDGET AUTHORITY

Senator Moss. Mr. Mitchell, does OMB have any problems with this liability not showing anywhere in the budget? We talked about uranium enrichment where we have a liability but the administration is not asking for any budget authority.

Mr. Mitchell. No. We perceive the risks as virtually zero as far as any future expenditure and therefore don't feel it appropriate to recognize a liability in the form of budget authority.

As I indicated earlier, this is the technology the Federal Government has developed and used. Mr. Schwennesen, how long have we been enriching uranium?

Mr. Schwennesen. About 30 years.

Mr. Mitchell. The first plant—gaseous diffusion—would be essentially the same technology. We think we know how to enrich uranium. We think we know what the costs are for enriching uranium. We think we agree with the private sector that the market is there. One of our concerns is getting the capacity online quickly enough to meet that market in the face of competition. The concern is really why do you need a Government guarantee if everything is so rosy? I think the answer to that question is that the private sector is skittish on a transfer of technology of this magnitude from Government to the private sector. They wonder if it will perform to the extent we think it will.

In this sense, we are selling. We are sellers and we are warranting our product. We think when the private sector goes into this business with this technology that they will make money at an appropriate rate of return and we will receive out of it our appropriate recompense in the form of royalties for the use of the technology.

In order to sell this technology, it is just a performance question. The other party, the buyer, wants assurance that the technology is going to work as predicted by the U.S. Government.

As you know, if the private sector weren't doing it we would come to a hard question about whether we would do it. You know the basic budget question here is are we going to spend $10 to $12 billion for an equivalent amount of enrichment capacity covered by the NFA bill doing it ourselves and take all the risk, or are we going to try to sell this technology to the private sector and get them to go into business and get us out of it?

CENTRIFUGE PROCESS

Senator Moss. Isn't the centrifuge, a new process on which we don't have all of this long experience?

Mr. Mitchell. That is correct. It is less certain. It does not have the proven track record.

Maybe Mr. Voigt would be helpful on that.

Mr. Voigt. That is true. However, we have worked on the centrifuge process since the early 5950's. It is not really a question of the technology, it is a question of the economics. We know it can enrich uranium, but the question is how cheap you can do it. Of course, the gaseous diffusion plants require much more power as contrasted to a centrifuge plant which requires one-tenth of the power.

COST OF POWER

Senator MOSS. So if the cost of power is high enough, it would change the economics?

Mr. VOIGT. Yes.

Senator BELLMON. There is also the factor that the Government presently owns the present three enrichment plants and these were built a long time ago at low capital outlay costs, and unless the Government raises the price at those plants, you will not be able to compete in the market.

Mr. MITCHELL. Of course, we have requested that authority. We think the Government, if folks want us to get into the business, ought to get the market price. We don't think there is anything inappropriate in getting a higher price.

Senator BELLMON. You will have to get a higher price or the private entrepreneurs can never get into it, isn't that true?

Mr. MITCHELL. Yes. What is the price on the world market?

Mr. VOIGT. $100.

Mr. MITCHELL. What did ERDA charge last year?

Mr. VOIGT. $62.30.

Senator BIDEN. I think the important fact is the three existing plants when fully operating are already contracted for. In other words, we cannot operate the contract book as in relation to our three existing plants.

OIL SHALE AND OTHER SYNTHETIC FUELS

Senator BELLMON. Mr. Chairman, I have another question or two.

To get back to the oil shale and the other kinds of synthetic fuel issue, I can't understand how it is going to be possible for the Government to guarantee loans on plants that are going to produce gas at roughly two times the current market price and crude oil or synthetic oil at from $2 to $10 above the market price and ever get anything back out of those plants. It looks to me like we just will write them off totally when we build them.

I think perhaps we need to get past this stage so we can improve the technology and perhaps be prepared for the time when the market may justify private sector building of these plants, but I think we are kidding ourselves if we think we will put up $4 billion and get every penny of it back.

Dr. MCCORMICK. I think the way it has to be looked at is in terms of what these plants will be competing with when they come on line in the early to middle 1980's.

For example, in the case of high Btu coal gasification, the Federal Power Commission is in the process of making a number of rulings on coal gasification, on Alaska gas transmission lines, on liquified natural gas, and on other alternatives to cheap domestic gas whose supplies are dwindling quickly.

Senator BELLMON. Let me ask you, how long have you dealt with the Federal Power Commission?

Dr. MCCORMICK. Several years.

Senator BELLMON. So have I and I have never found them to set a price that would justify the price on the total cost of production.

Dr. McCormick. We certainly would agree that the price at which interstate gas is regulated today is far below that which is required to bring on the supplies we think will be necessary.

Senator Bellmon. Put on your bankers' hat and with that kind of track record, how would you justify your director to make any loan based on what you hope the Federal Power Commission may do in the future?

GAS SUPPLIES BECOMING MORE EXPENSIVE

Dr. McCormick. Because in effect, the Federal Power Commission is operating under a double standard. They have one set of policies that have been governing their pricing decisions on natural gas, and they have another set which have been governing their pricing decisions on higher priced alternatives.

As I mentioned before, the Federal Power Commission has approved and given certificates to plants to convert naphtha, which is a refined petroleum product, into synthetic gas, above $4 a million Btu.

There are seven of these plants operating in this country. There is a realization, both in the Commission and elsewhere, that alternatives to natural gas are going to be substantially higher in price than the past regulated prices in natural gas. As I indicated LNG is coming in at over $3. Synthetic gas will be $3 plus. We don't know what Alaska gas will be but chances are that will be $2 to $3. So we are entering an era in which all supplies of gas are likely to be more expensive. In that kind of environment, the gas companies which are facing a problem of very serious curtailments are willing to make investments in projects which are going to produce products that are substantially higher in price than they historically have had to pay.

We have talked to a number of potential consumers of this gas, rate commissions, and so forth, and they are simply willing to pay the higher price because they want to keep their pipelines full and their customers continued to be supplied with gas.

Senator Bellmon. I don't want to seem contentious, but it seems to me you have just made the argument we don't need any guarantees. If the companies are willing to build the plants and if the FPC will set a price so they can cover their investments, why do we need guarantees?

PLANT COMPLETION RISKS

Dr. McCormick. The FPC will guarantee an adequate rate of return, but they won't guarantee the completion risks; that is, a plant that gets built and never operated because of a technical failure or because it gets hung up in a regulatory proceeding or environmental suits, and so forth. Again, we are building commercial-scale coal gasification plants which have never been built in this country before. and they have never been brought through all the regulatory hurdles which they will undoubtedly face.

An investor may be considering a $750 million loan on a $1 billion plant. Investors are quite leary of investments in which they have no experience. They simply have not seen these plants built and successfully operated. Frankly, they told us if a couple of these plants were operating and they had seen plants constructed successfully, go through the regulatory process, and so forth, then they would consider them in the range of more normal business risks and they would, in fact, make the loans without the need of any kind of Federal guarantees.

It is really a problem associated with the first of a kind nature of these plants.

Senator BELLMON. Senator Moss had to go to the floor. He has several questions which he asked me to present and ask for the response in writing. Without objection, I will insert these in the record and ask you to respond in writing.[4]

ELIMINATION OF GUARANTEES THROUGH COMPETITIVE BIDDING

Senator BELLMON. Is it possible for the Government to provide the technology there for uranium enrichment or any other fuel areas to private parties on the basis of competitive bidding?

If you open up and let Exxon and Garret and the others bid on centrifuge technology, would this eliminate the need for Government guarantees?

Mr. VOIGT. I don't believe so, Senator Bellmon.

One of the uncertainties as related to enrichment technology is that it has been vested in the U.S. Government from the beginning. It represents a black box to the people who are trying to raise the debt capital to go along with these projects. Inasmuch as there has been no commercial experience, and this has been covered in some depth during the 1974 hearings before the Joint Committee as well as the 1975 hearings on the Nuclear Fuel Assurance Act, they are not willing to invest large sums of debt capital until there is assurance that, indeed, the technology that has been developed by the Government will work in the commercial sector. That is a big concern.

Hence, that is why we are offering temporary Government assurance and warranties. I underscore the word temporary. Once the viability of the process has been established, then, following that point, the industry will take over the responsibility for it.

GUARANTEES AWARDED ON A COMPETITIVE BASIS

Dr. MCCORMICK. I might mention, Senator Bellmon, in the case of the synthetic fuels, we would expect—and the proposed legislation in fact requires—that the guarantees be awarded on a competitive basis.

Senator BELLMON. Could you repeat that last statement?

Dr. MCCORMICK. In the case of synthetic fuels, the proposed authorizing legislation requires that the awards be made on a competitive basis.

Mr. Mitchell just reminded me that the limitation on guarantees is the upper limit; that is, of course, 75 percent. We could entertain proposals that were for less than 75 percent.

Mr. MITCHELL. Even on the uranium enrichment, we surveyed the entire industry, all comers, and asked, "What is your proposal?"

We are in the process of looking at those proposals, and we think they would be in the best interests of the Government; that is, the best deal. It is just that simple.

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[4] See questions and answers beginning at p. 103.

The trouble is with this market, getting back to this perception of the buyers of this technology, they need temporary assurance that the technology is going to work and that they are going to be in a viable business. Everybody wanted that.

Now, there were varying degrees. Some have dropped out simply because what we were willing to offer and what they had to have were different. For some of the companies, fortunately, I think, there will be a meeting of the minds.

Senator BELLMON. I have no further questions of the administration witness except, as I say, I would appreciate it if you would respond to the questions which Senator Moss has supplied.

Senator BELLMON. We will turn now to Mr. Packer of the committee and Mr. Hughes to get the GAO view.

Mr. Hughes, proceed, if you like.

STATEMENT OF PHILLIP S. HUGHES, ASSISTANT COMPTROLLER GENERAL, U.S. GENERAL ACCOUNTING OFFICE

Mr. HUGHES. Mr. Chairman, we welcome the opportunity to be here this morning to present our views on the budgeting of Federal financial incentives for energy development.

LEGISLATIVE PROPOSALS

There are currently before the Congress a number of legislative proposals aimed at fostering the development of new energy supply technologies. S. 2532, to establish the Energy Independence Authority, provides for $83 billion in spending authority in 1977 and for up to a total of $100 billion in spending authority in subsequent years. Other proposals include the Nuclear Fuel Assurance Act, S. 2035 and H.R. 12112, to amend the Federal Non-Nuclear Energy Research and Development Act of 1974.

The Nuclear Fuel Assurance Act would authorize the Energy Research and Development Administration to enter into contracts for cooperative agreements with private firms to build privately owned uranium enrichment plants. ERDA's total authority under the bill would be $8 billion. H.R. 12112 would authorize ERDA to provide private firms up to $4 billion in support for synthetic fuel, renewable resources, and industrial conservation projects. The funds provided by the proposed legislation are intended to reduce or eliminate the risk borne by private firms in the development of technologies whose commercial success is uncertain.

FULL DISCLOSURE OF BUDGET IMPACT ON PROGRAMS

While the subject of this morning's hearing is the budgeting of energy incentives, our concern about the budgeting of financial incentives goes beyond this immediate concern. We believe that there should be full disclosure of the budget impact of all existing and proposed Federal credit and credit support programs. Only by full disclosure can the full impact of such programs be evaluated and tradeoffs with other Federal programs evaluated.

In this regard we support the basic philosophy and recommendations of the 1967 President's Commission on Budget Concepts which urged "a unified budget—with complementary components—which will put an end to competing measures." There has been a significant departure in recent years from this concept through the growth of off-budget programs. Outlays for existing off-budget programs are estimated at $11.1 billion for fiscal year 1977, and enactment of any of the financial incentives under consideration today will substantially increase both off-budget authority to spend and potential outlays.

We recognize that the exclusion from the budget of substantial amounts of budget authority and potential outlays in the energy incentives bills would be on the theory that they are loan guarantees, but we believe that in these cases loan guarantee status is in the nature of a technicality. Certainly these programs are significantly different in character and purpose from VA or FHA loan guarantee or insurance programs, for example. Indeed, the loan guarantee technique may not be the most effective way to achieve the objectives of the bills, and we recommend the proposed loan guarantees be carefully weighed against other options.

DIFFERS WITH ADMINISTRATION

If I could comment briefly in addition to that, Mr. Chairman, we do have a substantive difference with the administration proposal for dealing with the uranium enrichment problem, which interweaves in a fashion with the process problem this committee is dealing with. I simply wanted to place that on the record. We would go about achieving the next increment of enrichment capacity somewhat differently.

But apart from that, it seems to us that both with respect to the uranium enrichment proposal and with respect to synthetic fuels, the attractiveness of the loan guarantee approach here has something to do with the fact that by definition loan guarantees are manipulatable in a budget context. The apparent size of the budget can be affected, although ultimately liabilities are not changed.

ENRICHMENT AND SYNTHETIC FUEL PROBLEMS

We see both the enrichment problem and the synthetic fuels problem as essentially not financing, but technological problems. We think that guarantees are probably not the best way to deal with this situation.

In the enrichment area it seems to us there is an effort to sort of have it both ways. There either is a risk or there isn't. If there is a risk in the perception of some, it seems to me the costs of that risk could be very substantial. If there is not a risk, then why the guarantees?

The diffusion process has been going on for 30 years. It is operated at the present time by private contractors for the Government. The Government is in charge of some classified parts of the process. But it certainly isn't a mystery to Union Carbide how the process works down at Oak Ridge. If guarantees or supports or bailout provisions of one sort or another are necessary, then it seems to me they should be reflected in some fashion in the budget.

With respect to synthetic fuels, the situation is different. We have had less experience with the processes. They are in a more developmental stage. The risks are more substantial.

It seems to us again that the best way to approach these problems might well be through a guaranteed market or guaranteed price—

something of that sort—rather than to attempt to approach it via a mechanism which ordinarily is to affect interest rates and to deal with risks more clearly financial than these are. These risks are, as we see them, more technological, if indeed they are there at all.

OTHER OPTIONS

Senator BELLMON. You mentioned in your statement other options should be considered. You just now commented on market guarantees. Is this the only other option?

Mr. HUGHES. No, I don't think so. Government financed R. & D. certainly is one option. If the processes are not as yet perfected, some additional work by the Government may well be appropriate. We are not technical experts in this area, but it seems to us again that there are real questions as to whether there is or isn't a risk, even in technological terms, but more R. & D. again at Government expense, with the cost of that reflected in the budget is certainly an option.

Senator BELLMON. I can't speak for other members of the committee, but the thing that keeps coming back to my mind is the sort of bogus figures we have had from OMB regarding energy matters, particularly the income from the Outer Continental Shelf. Every year they come up here with figures that are obviously inflated.

I am curious here if they are not coming in with figures that are intentionally too low, trying to hide what would ultimately be a very substantial outlay of funds.

Mr. HUGHES. It seems to me, Senator, that is a legitimate concern. We hear enough about cost overruns to be aware of the problem. We can experience those sorts of difficulties really with good faith on the part of all concerned. Inflation does occur. Further, proponents of projects in all good faith, whether we are talking about the Corps of Engineers, a flood control project, a defense contract, or something else—proponents do want to see their project succeed and they do expect them to succeed generally on cheaper and simpler terms than may ultimately be the case.

I think the price levels of synthetic fuels, for example, are highly conjectural at this point. From what we know of the state of the art we would not expect any of these demonstration plants to produce fuel at competitive prices when they are producing fuel 5 years from now or whenever.

Mr. MITCHELL. Senator Bellmon, could I point out——

TWENTY-FIVE PERCENT LOAN GUARANTEE

Senator BELLMON. Before you go on, let me ask this. It is your conclusion, Mr. Hughes, that this 25-percent loan guarantee is inadequate, is that what you are saying?

Mr. HUGHES. Yes. First, Senator, we need a better definition of guarantee. What is a loan guarantee? We see these provisions as a bailout which, with respect to enrichment using the diffusion process can only help a single firm.

As to the synthetic fuels, hopefully there will be more in the picture. I gather from the testimony of the witnesses that there are more, but the firms are relatively few and the issue is not one of financial risk. It is a technological and commercial problem, much different from veterans' loan guarantees or other traditional guarantee programs.

We see the use of the loan guarantee approach here as distinguished from other possibilities, outright grants, for example, as attractive in part because, again, because ultimate costs are not reflected in the budget.

I think the gentleman said they had no experience to estimate losses. We certainly do not have a better number, but I don't think 25 percent is very good. The total risk is the total authorization. All the projects could fail, and it seems to us that in a commercial sense all of them will fail. They are not intended to produce fuel at commercial prices—by definition they aren't, since they are demonstration plants.

ESTIMATING RECEIPTS

Mr. MITCHELL. I would like to comment—I would like it in the record—on the Outer Continental Shelf that we published this year with the budget our estimates for the last 5 or 6 years and they do indeed show what you have indicated, that we are all over the lot. Some years we are under and some years we are over by very substantial amounts.

We have also made available to the Budget Committees our estimating techniques and made fully available to the Budget Committees and anybody else that wants them the raw data that we use from the Department of Interior. We do it on a probability analysis that tries to take into account such things as environmental lawsuits and so on, which the mathematicians will tell you are extremely difficult to estimate in a valid, precise way.

We do the best job of estimating we can. It is done by Civil Service professionals in the most professional way they can. If anybody has a better way of estimating those receipts professionally, let us know. We have had to come up 6 or 8 months before the Congress has had to make a decision on our estimates, and what generally has happened is that the market has moved against us, if you will, so the hindsight then goes into a lower figure.

But again, if anybody has a better way of estimating those receipts from a professional standpoint, we would be delighted to adopt it.

Senator BELLMON. I might say, Mr. Mitchell, I think it was Miss Ross who did the Budget Committee probability estimate this year and I thought she came much closer to it.

Mr. MITCHELL. Some months later, I might add, when considerable experience had occurred.

Senator BELLMON. Are you using these same professionals to make this OCS estimate to make the 25-percent estimate you made here?

Mr. MITCHELL. We have indicated here where we do think we know what we are doing in uranium enrichment. We are fairly confident of that figure. Where there is uncertainty, not only because it is an emerging technology, but because we don't have control over it, since private industry is building these plants. We have been somewhat less optimistic about the future.

You know, I think we get tied up with words like bailout and so on, that show how somebody is going to make a buck off of a loan guarantee or that the guarantee isn't necessary. The ultimate conclusion there by those that make such arguments is the Government ought to do it.

PRODUCE ENERGY THROUGH PRIVATE INDUSTRY

What we are trying to do in both of these programs is a philosophical matter, to get private industry producing energy, be it synthetic fuels or enriched uranium. The best way we think to do that is to look over the market and see the least that the private industry will take from the Government. If that is a loan guarantee, maybe it won't work. You may be absolutely right. But if it does work, you are much better having a loan guarantee and never putting a dime of the Government's money into it than you are in making a grant or doing it yourself.

In each of these cases it seems to me the logic is, first, do you want private industry doing it or don't you? If you do, and they won't do it without some Government intervention, you ought to design the least amount of Government intervention that will induce them to act. That is what we have tried to do here.

You are absolutely right. It may not work and we may have misestimated. But once you make those decisions, then the question is how realistic are the numbers you put in for budget authority, for example, in anticipating outlays, and there you can have differences, I agree. It gets a little like your OCS question. It is very difficult to know what the price of gas is going to be 5 or 10 years out, and that is really the kind of uncertainty that is involved.

What we have tried to do is say to the Congress, especially in the appropriations process, this is the whole package. This is what you may be stuck for. Either you think it is important and in the national interest and agree with us, or you don't.

This other question of budget authority is trying to estimate a cash outlay in the future; a very, very tough question. We don't by any means try to mislead people that you may not lose the whole thing. That is why we have gone to the Appropriations Committee and said, "Before we start, here it is. This is what we are in for."

Senator **Bellmon**. Mr. Packer?

BUDGET AUTHORITY AND OUTLAYS

Mr. **Packer**. I am embarrassed to be in the position of defending the administration at times. I think the very obvious point, but one that may be missed, is the difference in political emphasis on budget authority and on outlays in the deficit. The leases are extremely important because every time the lease estimate changes, the outlay estimate changes and the deficit estimate changes.

Frankly, budget authority does not get the significance that it should get, but the budget authority figure for 1977 is $449 billion, which is a number I have to check. It is not a number anybody keeps in his head like the $50 billion deficit.

I think the two important criteria to look at are what will that action do to outlays this year or some subsequent year, and what will they do to economic activity this year? Those are the two separate questions. I don't know, the answers to them change as a function of whether you put 25 percent or 50 percent or 100 percent of the authority on the budget.

Now it is slightly different if you put zero on as you do with the nuclear enrichment, in which case, you might not consider it anyway.

But it is, I think, important for the Budget Committee in respect to its responsibilities for the longrun outlay figure, and its responsibility for the shortrun macroeconomic picture, to take a look at any Government activity that will affect either one of those two things.

BUDGET COMMITTEE'S INTEREST

Senator BELLMON. Mr. Packer, it seems to me that where the Budget Committee's interest should lie is this: If by some action of the Congress we are embarking upon a series of projects that will ultimately amount to an $8 billion outlay, we should know it. I think if it is going to be $8 billion, we should know that. If it is going to be $2 billion, as the administration claims, that is a different sort of decision.

Mr. PACKER. That's right. The $8 billion figure is the relevant figure; and if they put $2 billion of it on or $6 billion, that should not divert us from really two figures, one figure is the amount of Federal exposure with regard to outlays. So if it is a 75-percent guarantee on an $8 billion project, then the Budget Committee in its accounting of what may happen in the future has to be concerned about that $6 billion of Federal exposure. But it also must be concerned about the $8 billion that is diverted from some other use in the national resource sense and that is the $8 billion figure, and that would be so whether all of the $8 billion showed on the budget or not.

FEDERAL GOVERNMENT CAN DIVERT RESOURCES

There are many cases in which the Federal Government can divert resources without putting a nickel on the budget. The requirement in the energy area, for example, for certain energy efficiencies and automobile engine efficiencies, forces General Motors and the other automobile manufacturers to spend money in a way they would not otherwise, and it does not show up on the budget.

If we went to mandatory health insurance in which none of it appeared on the budget, we just mandated that every employer had to have health insurance for his employees that met some Federal standards, it would substantially increase the amount of money perhaps that goes into the health area without affecting the budget.

GUARANTEE PROGRAMS NEED CONTROLS

Senator BELLMON. What I am going to say has nothing to do with the present program. It seems to me every time the Government makes a guarantee we get stuck—Lockheed, the western railroads, New York City. We might as well face the fact if we make the guarantee, we are going to spend the money.

Mr. MITCHELL. As I live with this longer, I think there is a lot of truth in that. One solution, maybe not solution—one control on that that was implicit in Mr. Packer's remarks is that in addition to a debt limit, we ought to have some sort of control by the Congress that the amount of Federal or the amount of private paper we guarantee ought to be under some sort of aggregate control.

I realize that is quite startling, but time and again we all know that the proposals, the Kennedy energy conservation amendment, for example, are a guarantee program, and if we ever listed end to end the guarantee programs, some of which get far along, the solid waste that has now passed the Senate—if we ever added these things end to end, it would be astonishing as to how much we are now doing by guarantee.

We have moved from the old backdoor on appropriations into the guarantee technique. The administration arrived at guarantee on these programs principally in accordance with the philosophy I indicated, either you want the energy or you don't; you want private industry or you don't, and you go to the least amount of involvement.

But in the actual sense it is relevant in the point of view of the availability, what you are doing to the market, what you are doing in Federal intervention and so on, to have some sort of control in the aggregate on what we are guaranteeing, especially with the financing bank now.

Dr. McCormick. I have two comments, one with respect to the distinction between the railroads and New York City and some of these projects. There are two major distinctions.

In some of these guarantees you have the investors or the project sponsors substantially at risk. I think in that case, where you have the investors substantially at risk, they can lose a lot of money—such as a coal gasification plant—$250 million. I don't think that can be called a bailout.

If you are going in after the fact and rescuing something, that may be referred to as a bailout. So I see a difference here and the difference is whether it happens before or after the fact, and also whether the project sponsor or the investor has anything at risk.

I think in the kinds of projects we are talking about there is substantial risk involved.

Mr. Boyd. That is also true of enrichment as well.

MARKET GUARANTEE VERSUS LOAN GUARANTEE

Dr. McCormick. With regard to a point Mr. Hughes made, he suggested that market guarantees are the preferable approach. I would like to say we have looked in detail along the lines of the logic Mr. Mitchell laid out. Once you have gotten to the point you want to have a minimum kind of Federal incentive for the private sector to carry on the activity, what are the best kinds of incentives? We looked at a number of criteria, including the cost to the Government, exposure, effects on competitiveness, and a number of other factors.

We concluded that loan guarantees for a number of these major energy projects are the most appropriate. I think the best example of where a market guarantee would not work at all and where a loan guarantee would do the job is in the case of synthetic gas. Here we have a situation where the market is guaranteed.

The Federal Power Commission is willing to give a certificate to, in effect, guarantee a price and there are plenty of people out there willing and dying for the gas. But it is the inability of the project sponsors, because of his limited net worth relative to the size of the project, and the risk perceived by the potential investors to make those loans. In that case, I would submit the loan guarantee is the proper incentive and a price or market guarantee would not work at all.

Senator Bellmon. Mr. Packer?

SHOULD LENDING APPEAR ON-BUDGET AS OUTLAY?

Mr. PACKER. There are some who suggested that the lending itself appear on-budget as outlay. I would argue that might not be the best way to go about this sort of thing.

First, in a sense the budget outlays should indicate the size of the Federal sector. If, in fact, the Federal sector produces enriched uranium that is a Federal activity, then it should very properly appear on the budget. On the other hand, if a commercial private enterprise is enriching the uranium, then correctly that should not appear on the budget and exaggerate the size of the Federal sector by including things that are really not being done in the Federal sector.

As a matter of fact, economists when they use the impact of the budget on the economy use a form of the budget, the national income accounts budget, that excludes the exchange of assets. For example, we do not look at OCS lease receipts, and we do not look at lending because that is a financial transaction that does not really absorb resources within the Federal sector.

So I would think that it would be distorting from a macroeconomic point of view to put the lending in the budget. Now if the Federal Government is going to operate a synthetic fuel plant or a nuclear enrichment plant, then it is a Federal activity and it belongs there, but not if it is in the guarantee area or even in the lending area.

Senator BELLMON. Mr. Hughes?

Mr. HUGHES. Mr. Chairman, I don't have any philosophical disagreement with what Mr. Packer has said. What we are debating really among us is what the nature of the transaction is that takes place here between Government and private industry.

You mentioned the Lockheed situation. Certainly it is a different situation than this one that we are addressing here this morning. But it has many of the same elements and characteristics. The direct budget impact is there.

If we do not somehow have the opportunity to weigh budget impact as realistically as we can, both on the budget authority side and the outlay side, weigh one program against another, we have deprived ourselves of really the one decent opportunity we have to consider tradeoffs and alternative opportunities.

RISK SITUATIONS DIFFER

We see the risk situation in each of these three areas as different. On the diffusion plants, the risk, I would agree, is minimal. The question as to why you need the guarantees at all is a good one. Or, why you need guarantees of the size and nature that the present draft agreements contemplate?

With respect to the centrifuge, the technology is nowhere near as advanced. There are questions on the economics, that is, whether that will be competitive, although the signs are good. There are also technological questions and the risks, it seems to us, are higher in those circumstances.

The budget ought to reflect that. With respect to the synthetic fuels, again since the technological situation is different, the risks again are high in technological terms and it seems to me that it is a no-risk situation on economic grounds, in the sense that, by definition the projects will be uneconomic. However, if there is a guaranteed market for output at whatever price, since we know that technologically we can produce synthetic fuels I have some trouble understanding that situation. But I think there are economic risks in both the short and the long run, and those are very substantial and the budget should reflect that.

I come back to the fact that guarantees, if we wish to call them that, are much closer in their inherent characteristics to the Lockheed situation than they are to the veterans or FHA loan guarantees. Somehow, we ought to treat them accordingly in the budget.

Senator **Bellmon**. Let me ask Mr. Mitchell and Mr. McCormick one more question and then I would like to sum up and, as far as I am concerned, that concludes the hearing.

GOVERNMENT-BUILT PLANTS

When this country undertook during World War II to develop synthetic rubber, which we needed desperately, and develop the expanded aluminum production, we built plants. The Government built those plants and leased them to the private sector and now I assume most of those have been sold to the private sector.

Is there some reason why that kind of approach wouldn't work with the synthetic fuels?

Dr. **McCormick**. It would work. It is a very costly approach.

Senator **Bellmon**. Is it more costly than the loan guarantee?

Dr. **McCormick**. In terms of the liability of the Federal Government it is quite a bit more expensive.

Senator **Bellmon**. Is it more desirable than the loan guarantees, Mr. Packer, in your point of view of getting it on- or off-budget?

Mr. **Packer**. If, in fact, the Federal Government wants to build it itself, it should fall on-budget. It is not only the rubber plants during the war. I think in the fifties aluminum plants were built when there was a shortage and the Federal Government sold them, and I believe those plants are still operating. To a great extent you are correct if, in fact, the Federal Government wants to assume that responsibility.

I point out a couple of places why I would opt for the other direction. If you had a price guarantee for a synthetic fuel plant, and I am concerned that yesterday I thought we heard prices of $4.75 and today the price was $3.25—but let's say there is a guarantee of $3.25. If a private enterprise builds that plant, it always has an incentive to make that plant more efficient. That is, if it guarantees that $3.25 and it turns out to be $3.75, it is losing a half dollar per Mcf. Thus, it has an incentive to try to bring that price down.

If it is $3.25 and they can bring it in at $2.75, they are making 50 cents. It is still an incentive to bring it down further to increase their profits. If the Federal Government undertakes to build that plant, their concern with the continued efficiencies to make the price lower will really be less than the private entrepreneur dealing with that plant. So I think there is a difference.

I think you would have to weigh it. The administration apparently did. I don't know that we have, but I think you would have to weigh the risks and the advantages. That advantage is clearly there, in my judgment. Whether it overrides all the other disadvantages of going outside is a policy question.

Senator **Bellmon**. The administration did weigh this alternative, I am sure?

Mr. **Mitchell**. Yes, sir.

CONSTRUCTION OF SYNTHETIC FUEL DEMONSTRATION PLANTS

Senator **Bellmon**. I will try to sum up as best I can. Based on most of the testimony with perhaps some exceptions the conclusion is that 25-percent loan guarantee will get the synthetic fuel demonstration plants built, is that right?

Mr. **Mitchell**. Seventy-five percent.

Mr. **Packer**. Seventy-five percent Federal exposure to 25 percent on the budget.

Senator **Bellmon**. The proposition is there will be a 75-percent guarantee and of that the assumption is that a quarter will be finally lost. That is where we get the $2 billion figure?

Mr. **Mitchell**. The $2 billion is the 75 percent that would support construction of $2.7 billion or something like that. The 75 percent is equal to $2 billion, 100 percent is equal to whatever the proportion is.

Mr. **Packer**. There is $2.7 billion worth of plant going up, on which the Government exposure is $2 billion, and 25 percent of that $2 billion—or $500 million—is put on terms of budget authority. It does not affect outlays in this year because if the default occurred, it would occur in some subsequent budget year.

I don't know that is an estimate of the loss.

Dr. **McCormick**. That is an estimate of the maximum probable loss.

Mr. **Packer**. If you recall, Senator, last year we had a similar situation in some regards with the safety net where we were going to guarantee loans to foreign countries with regard to the energy crisis. We originally put budget authority on—rather the administration originally had budget authority for the whole U.S. exposure to that safety net and somehow or other they were able to remove that as the thing went forward.

Senator **Bellmon**. The thrust of the whole morning's testimony is that exposure is down to some $500 million, but we will be able to get synthetic fuel demonstration plants under construction?

Mr. **Packer**. Exposure to the Government of $2 billion, of which a half billion dollars is shown on the budget, but the real exposure is $2 billion.

OPERATIONAL PHASE

Senator **Bellmon**. That covers the construction phase. What about the operation? Is there any exposure to the Government during the operational phase?

Mr. **Mitchell**. Yes, until the guaranteed debt is repaid.

Senator **Bellmon**. If these plants operate at a loss, they will simply be shut down, I take it?

Mr. **Packer**. If there is a price guarantee, we are exposed.

Dr. **McCormick**. The initial package does not entail any price guarantees.

Mr. **Hughes**. There is authority for the price guarantees in the bill?

Dr. **McCormick**. It is in the Banking Committee version of the bill.

Mr. **Hughes**. Do you think that is necessary?

Mr. MITCHELL. That is not the version, is it?

Dr. McCORMICK. Do we think that is necessary? There may be some projects in which price guarantees can be useful.

Mr. HUGHES. I will bet there will.

Dr. McCORMICK. We have suggested that in the testimony we have given and in the original proposal we made.

Senator BELLMON. Could you clear the matter up in a written statement whether or not there will be further exposure after the plants are built?

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., August 24, 1976.

Hon. HENRY BELLMON,
U.S. Senate.

DEAR SENATOR BELLMON: It has come to ERDA's attention through Mr. Thomas Foxwell of the Senate Budget Committee staff that one item of information requested during the Committee's hearings on Federal financial incentives was not provided as an insert to the Committee record at the time ERDA provided such materials.

You asked whether or not there would be further exposure of the Federal Government beyond that implied by a loan guarantee in the event a synthetic fuel plant was constructed with Government assistance. Generally speaking, there would be no further exposure since, at the time a loan guarantee agreement is negotiated the sponsoring company would agree to assume the market risks related to product prices. One exception would be if the fuel from the plant, because of severe technical or other delays encountered during construction or start-up, became so uneconomic that the sponsoring companies would have to default on the guaranteed loan. In this situation, the sponsoring companies would forfeit their entire equity share which would, at a minimum, be 25 percent of the total project cost. Upon default the Federal Government would assume complete ownership of the facility and would then decide whether or not it is in the public interest to keep such facility in operation. Such a decision would involve comparing the costs of such continued operation with the benefits obtained from the information and expertise accumulated from continued plant operations.

It should be emphasized that since the technological risks in proceeding with synthetic fuel commercial demonstration facilities are not large, that the risk of plant default and therefore the possibility of further Government exposure is not great for the large majority of the plants which we proposed to provide financial assistance.

If there is any further information you need regarding our testimony, please do not hesitate to let me know.

Sincerely,

WILLIAM T. McCORMICK, Jr.,
Director, Office of Commercialization.

Ms. ROSS. If the plants were to close down because it was uneconomic, the Government would have to pay off the loan; and there would not be anything else to stand behind it. So if an operational problem came up later on, that would be exposure. That would be exactly where the default would occur.

Mr. PACKER. It is an either/or situation. If the price guarantee was made out, presumably the $2 billion would not be.

Senator BELLMON. But I can see where the Congress is faced with the dilemma of you closing the plant down and paying the total loss or putting up some subsidy to keep the plant going.

Mr. MITCHELL. Presumably they would make some judgment of the market then.

SYNTHETIC FUELS

Senator BELLMON. I think we ought to be careful we keep things separate. There are two types of fuel activities. One is the nuclear fuel assurance and the other is the synthetic fuel demonstration plants. Are the losses thought to occur only in the synthetic fuels?

Mr. MITCHELL. That's right.

NUCLEAR FUELS

Senator BELLMON. Is there any exposure at all in the nuclear?

Mr. MITCHELL. The exposure is $8 billion, but we anticipate no expenditure.

Senator BELLMON. There will be nothing on the budget?

Mr. MITCHELL. That is our proposal, no budget authority.

Senator BELLMON. You are asking the Congress to take some pretty long chances, some chances that the investors would not take.

Mr. BOYD. On the point of the Nuclear Fuel Assurance Act, the detailed contracts for each and every contract now negotiating will lie before Congress and they will have the opportunity to look at each of the contracts in detail and, in fact, specifically approve them prior to ERDA entering into it. So you are not really buying anything in a poke, so to speak.

Senator BELLMON. We hope we won't.

Our record on that score is a whole lot better than OMB's, I am afraid.

There are no further witnesses and there are no further hearings scheduled.

Mr. PACKER. Senator, may a statement be submitted for the record?

Senator BELLMON. Without objection, your statement will be made a part of the record.

PREPARED STATEMENT OF ARNOLD PACKER, CHIEF ECONOMIST, SENATE BUDGET COMMITTEE

Budget Treatment of Loan and Price Guarantees

Consideration of energy financing legislation has increased Congressional interest in the budget treatment of loan and price guarantees. The peculiar uncertainties that attend long-term investment in new energy technologies suggest a need for some government involvement to reduce the risk. At the same time, some observers have expressed concern that loan and price guarantees will become the new backdoor for funding programs that could not compete successfully for scarce budget dollars. Putting aside the merits of any particular guarantee, it would be useful if the Congress developed a uniform budget treatment for the various guarantee programs.

Two criteria that should be considered in deciding whether or not to place a government activity on budget are: (1) What does it do to federal outlays in the next and subsequent fiscal years, and (2) What effect does the government activity have on economic activity.

I will discuss loan and price guarantees in terms of both of these criteria.

GUARANTEES AND OUTLAYS

Putting authority in the budget for loan guarantees is not likely to make these activities compete with other programs unless outlays are involved.

The deficit is clearly the politically significant number in the budget. Only outlays and revenues count in computing the deficit; therefore, the total for budget authority does not receive as much attention as these other numbers (e.g., the figure of $449 billion for budget authority in fiscal 1977 is not a widely remembered number although the $50 billion deficit is). This makes sense because an increase in budget authority that arises from increases in social security trust fund collections or interest payments is not meaningful from the standpoint of current congressional action (although budget authority in the social security trust fund may influence the Finance Committee's view of benefit increases). On the other hand, budget authority made available each year through current action by the Congress is extremely important. Clearly in many program areas, such as defense procurement or education budget authority is most important. One reason for this is that this year's authority determines the outlays and deficits of future years. In these programs the only real control Congress has is over future outlays through current authority.

The political sensitivity of outlays arises because the Congress has a view on what is the appropriate fiscal position; whether it be balancing the budget or incurring a deficit or surplus. There is no analog for budget authority. Therefore, it is unlikely to make any great difference from a budgetary standpoint whether full or partial authority for a loan guarantee is put on budget.

A loan guarantee for a loan that defaults causes outlays and is therefore quite another story. Spending to cover a default will compete with other spending because it increases the deficit. Unfortunately, it is too late to do anything about it when the default occurs. A loan guarantee is a contingent liability that must be honored just like paying unemployment compensation. Recognition of the liability should precede the decision to go ahead. Spending will rise automatically if an appropriate contingency is not made to cover an outlay caused by a loan default.

In many cases, a default will occur at some time well beyond the budget year in which the guarantee becomes effective. In these cases, putting a loan or price guarantee on budget will not lead to an increase in the deficit in the year in which the loan is made, but only later when the default occurs.

A direct loan made this year does increase this year's outlays. But it would be unwise to replace loan guarantees with direct loans. The deficit or surplus is one measure of fiscal stimulus. In effect, the federal government is a net spender or saver in the economy. Unlike direct spending, a loan is only an exchange of assets, no one is richer by it. Most economists use the National Income Accounts (NIA) budget, rather than the unified budget, so as to exclude asset exchanges from their measure of fiscal stimulus. Loans, sales of off-shore oil leases, and other asset exchanges in the unified budget are excluded from the NIA budget. The more frequent problem is not that guaranteed loans are used in place of direct loans but, rather, that direct loans or other asset exchanges appear on the budget.

Price guarantees are a similar story. Consider a guarantee program that would commit the government to pay a synthetic fuel producer the difference between his production cost and the equivalent cost of oil (say, $1.00 per Mcf). Construction of the plant might begin next year, but the federal subsidy would not start until the plant was operating in 1980 or so. Clearly, the outlays would appear on budget in 1980, the year they occur. But the economic activity of building the synthetic fuel plant would start next year.

In summary, the problem in dealing with loan and price guarantees is that the economic activity precedes the potential outlays by many years. While it is important that Congress be aware of the future outlay implications of current decisions, there is no way to put these programs "on-budget" in a manner that will force trade-offs between guarantees and current direct spending programs.

This difficulty does not mean that the Budget Committee has no interest in loan or price guarantees. The Committee must be involved because the guarantee creates the potential for future outlays and because the loan guarantee will have a macroeconomic effect in the year that it is granted.

MEASURING ECONOMIC EFFECT

Loan and price guarantees are not the only federal programs that have an impact on the economy even though they do *not* show up as budget outlays. For example, legislation requiring all employers to provide comprehensive health insurance for all their employees would have an economic effect even though there might be no federal government outlays. Similarly, mandating engine efficiency or pollution controls on automobiles allocates economic resources without affecting the federal budget. One way of evaluating these resource decisions is to begin with an idea of how much of the economy's GNP should be devoted to health or transportation. If the Congress had a view of the national energy budget, it could presumably choose between a synthetic fuel plant and a program to insulate homes. But in this case, we would compare the total resources employed not the size of the guarantee or subsidy.

This type of analysis is quite a long way off. It would require Congress to say, for example, we believe the country should spend $200 billion for energy in 1980 of which $50 billion is for imports, $10 billion is for federal programs, and the remaining $140 billion is private expenditures. With this plan the Congress could consider whether $2 billion is better spent for insulation, synthetic fuels, or direct ERDA programs, or whether the energy budget should be increased to $202 billion.

Another approach is to have a credit budget for all federal loan guarantees and similar programs. In this case, guaranteed loans for energy would compete against student loans, farmer loans, housing loans, and so on.

The full consideration of loan guarantees is a complex undertaking. Simply putting budget authority on-budget will not solve the problem.

Senator BELLMON. Thank you, Miss Ross and gentlemen.

[Whereupon, at 11:30 a.m. the task force adjourned, to reconvene at the call of the Chair.]

WRITTEN QUESTIONS FROM SENATOR MOSS TO MR. McCORMICK, DIRECTOR, OFFICE OF COMMERCIALIZATION, ERDA, AND THE RESPONSES

Synthetic Fuels

OPERATION OF SYNTHETIC FUEL PLANTS WITHOUT SUBSIDY

Question 1. Given an estimated production cost of synthetic fuels of $20—$25 per equivalent barrel, and a world oil price presently around $13 per barrel, how will synthetic fuel plants be able to operate without subsidy?

Answer. Except for synthetic high Btu gas the equivalent price of which is estimated to be $20–25 per barrel equivalent ($3.50 a million Btu), ERDA estimates that synthetic fuels such as shale oil that would compete with world oil could be produced in the range of $15 a barrel. Thus, it is expected that the first synthetic fuel plants producing substitute oil will be marginally competitive with world oil assuming the price of the latter continues to rise slowly over the next five years. ERDA's view is substantiated by several potential project sponsors who believe they will be able to compete with world oil assuming its price does not fall precipitously. The price of high Btu synthetic gas should not be compared with imported crude oil. This is because high Btu gas is a premium product whose only present and foreseeable substitutes are gas from naptha at $4–5.50 per million Btu, imported LNG at $3.00 per million per Btu and higher, and Alaska gas the price of which is yet to be determined. Further, high Btu gas, unlike petroleum products, is sold in markets which, whether regulated or not, are dominated by scarcity.

PRICE GUARANTEE THROUGH FPC REGULATION

Question 2. If a subsidy is required, to what extent is it likely to be provided by regulatory approval to roll-in synthetic gas at a price which covers its high production costs—that is, what proportion of synthetic fuel production under the proposed $4 billion program would effectively receive a price guarantee through FPC regulation?

Answer. Under the proposed $4 billion guarantee program, the two large scale synthetic high Btu gas plants would be required to obtain FPC certification, and thus would be provided a rate which would ensure recovery of reasonably incurred costs. The FPC certification will allow rates which, by their nature, are incremental.

These two plants would produce an equivalent of about 80,000 barrels per day out of a total of about 200,000 barrels per day of synthetic fuel production which could be initiated under a $4 billion program. It should be emphasized that the approved rates are not subsidies, but rather the cost of obtaining the new higher priced alternatives to dwindling supplies of natural gas. The FPC has already approved rates for other alternatives well in excess of the present interest regulated price and even in excess of the current price of gas in the intrastate market, which is approaching $2 per million per Btu.

SUCCESSFUL OPERATION WITH LOAN GUARANTEE

Question 3. For remaining synthetic fuel plants whose products were not sold in regulated markets, will they be able to operate successfully with only a government guarantee of their loans? How will they make up the difference between their high cost of production and the lower sales they can get in competitive markets?

Answer. In the case of oil shale conversion plants, whose products will be sold in unregulated markets, it appears that these fuels can be produced at approximately projected world oil price at the time they become operational. There is some risk, however, that world energy prices could fall over the next 5–10 years. The Government loan guarantee would not only reduce the exposure to risk of the project sponsor but would also permit financing a large part of the project on a debt basis, and thus reducing the equity share which would normally require a substantial before-tax-rate-of-return (20 percent or greater). Several oil shale project sponsors have indicated that a loan guarantee will provide them the basis to initiate these projects.

In the case of industrial fuels which will compete in unregulated markets, there may be need for some price subsidy during the initial phase of plant operations. As world and competing energy prices rise, however, it is expected that such price subsidies will cease to be required. In the case of biomass conversion plants, because of the additional economic advantage associated with having to dispose of the waste, it is expected that these plants can be economically viable with just a loan guarantee.

UNREGULATED INDUSTRIAL FUELS

Question 4. Given the gap between sales price and production cost, what is the likelihood that a synthetic fuel plant operating in a competitive market will not be able to pay off its debt obligations?

Answer. As discussed in the answer to question 3, the only category of synthetic fuel that could present a problem from the point of view of adequate recovery cost is the unregulated industrial fuels. As previously noted, it is this category that may require the use of price guarantees.

COST OF LOAN DEFAULTS

Question 5. What is the best estimate for the overall $4 billion loan guarantee program of the outlay cost to the government of loan defaults?

Answer. Because of the absence of previous experience in commercial-scale synthetic fuels ventures in this country, it is difficult to estimate the expected number of plant defaults. For the purpose of providing a credible amount of reserve coverage, ERDA has estimated that the maximum probable cost of defaults would be 25 percent of the total outstanding loan guarantee amount. This would mean that $1 billion of borrowing authority (counted as budget authority) would be required to cover the $4 billion in guarantees for FY 1977 and 1978 that are contained in the pending legislation. Five hundred million dollars would be needed in FY 1977 and $500 million in FY 1978. The outlays, in a budgetary sense would, depend upon whether defaults actually ever occurred. Since it is not known whether defaults will occur or when they will occur, no outlays are predicted at the present time.

ERDA CAN EXERCISE OPTIONS IN CASE OF DEFAULT

Question 6. Will ERDA itself make payments—for example, payments of loan principal and interest or of taxes—to help a synfuels venture which is facing default stay in business? How much might this amount to in outlays?

Answer. In the event a project does go into default, ERDA could exercise a number of options, some of which may provide that the plant remain in operation. The decision whether the plant should remain in operation would depend on the particular circumstances associated with the reason the plant went into default. In some situations, it may be in the interest of the taxpayer to continue the plant operation at some small subsidy rather than close the plant completely down. On the other hand, if the project is a total failure (a very unlikely situation) it may be in the interest of the taxpayer to close the plant down and scrap it. It should be noted that a decision to keep the plant operating at some subsidy may be a less expensive option than closing the plant down completely and paying off the defaulted loan. Of course, it is difficult to estimate budget outlays for hypothetical situations unless the circumstances of default are carefully defined.

PRICE GUARANTEE AUTHORITY

Question 7. Will ERDA request price guarantee authority to reduce the chance of default? What would be the expected outlay cost to the government of a package of price and loan guarantees?

Answer. ERDA does not intend to request price guarantee authority to reduce the chance of default after a loan guarantee or other incentives are granted. As previously indicated, there are instances in which price guarantees could be an effective incentive. In these instances. ERDA may request such authorization.

Uranium Enrichment

PRIVATE URANIUM ENRICHMENT VENTURES

Question 1. If private uranium enrichment ventures are expected to be profitable, but the risk involved in realizing that profit is so great that the government must assume a major part of it, what realistically is the likelihood that a plant will not go forward successfully and the government will have to make good on the risk it has assumed?

Answer. It is expected that private enrichment ventures would be profitable once they become operational. The risk to the private entrepreneur is that the project can not be constructed and brought into successful operation. Because of the massive capital requirements of these projects they must be financed on a project basis and primarily from borrowings. Prospective lenders will not now assume risk in uranium enrichment projects no matter how strongly the Government believes in its technology because:

(a) The investment community sees no truly commercial experience in uranium enrichment since it is not persuaded that the experience of private companies operating Government facilities under Government contract and Government direction is really "commercial" experience.

(b) Since the critical elements of the technology are classified, and will remain so, the investment community sees a "black box", which it cannot evaluate, as critical to its investment.

(c) Capital requirements are so huge that even an extremely low risk venture will not be accommodated in the absence of demonstrated commercial experience.

On the other hand prospective equity investors are willing to assume substantial risks provided that the workability of Government-supplied technology can be warranted. The problem basically, therefore, is that assurances be provided the investment community that Government technology can be applied to result in successful commercial plants or that, in the remote event that it cannot, their investment can be protected.

We believe that the risk that a plant cannot go forward successfully is extremely low for two basic reasons:

(a) Gaseous diffusion is supported by more than 30 years of large-scale Government program during that period. Gas centrifugation has been under intense development for some 15 years and substantial numbers of production size prototype machines have been operated for long periods. While large scale centrifuge enrichment production projects *per se* have not yet operated, there is no question regarding the soundness of the technology.

(b) Government involvement in projects under NFAA will be such that it can satisfy itself that technology is being applied correctly, and insist that design and construction changes be made if necessary, as a condition of its warranty of the technology. Any Government costs for technical support and surveillance must be borne by the private project.

ESTIMATED OUTLAYRE OF POSSIBLE PLANT FAILUS

Question 2. What is the best estimate of the outlays the government will have to make in light of the possibility of failure of a private uranium enrichment venture?

Answer. The question presupposes a failure which we do not believe will happen because, as noted in the answer to the previous question, we are totally convinced that the new plants applying Government-developed technology can and will be brought into operation successfully. Because of the nature of ERDA involvement in the design and construction of private plants in order to warrant its technology, the risk of such plants failing to perform should be no higher than were the plants to be constructed by ERDA using Government appropriations. And, since outlays projected upon possible failure of an ERDA-constructed plant are not made, we believe that the same logic should prevail in this case. The ability of the technology to be applied successfully should be accepted as a given.

There is the theoretical possibility that the private owners would fail to complete and operate the project. In such event, they would stand to risk the loss of up to several hundred million dollars depending upon the point in time at which this occurred and the circumstances of the failure.

In the case of the proposed diffusion project, sufficient *committed* customers to assure the commercial viability of the project must be in hand before construction can proceed. In addition, ERDA must be provided reasonable assurance (satisfactory to ERDA) that the project can be financed to completion before construction can proceed. Thus, we believe that possibility of failure of the diffusion project is exceedingly remote. In such cases the Government would acquire the domestic debt and domestic equity then in the project and ERDA would expect to then complete the project through appropriations which would be requested from the Congress.

We estimate that the acquisition cost for the UEA project (assuming the maximum case where reason for the failure was caused solely by Governmental action) to range from about $50 to 70 million after one year to about $1½ billion (1977 dollars) at project completion assuming a 40–60 split between domestic and foreign financing. A different proportion of foreign financing would change the acquisition cost proportionately. (While 60% of foreign has been projected by UEA the actual proportion will be known only when negotiations under the framework of NFAA are concluded.) It is our judgement that the probability of failure decreases steadily with time as design and construction proceed and as more and more private equity funds are involved.

The situation is somewhat different with the centrifuge projects due to the status of technology development, although we believe that it is equally valid that it can be accepted as a given that the technology can be applied successfully. Also these plants can be brought into operation as individual production modules (each about one-tenth of the 3 million SWU full plant size) with modules committed as permitted by the market. Again, assurance of market for module output is required before commencement of module construction, as is assurance of adequate financing arrangements. Therefore, in order that the national objective of assuring that several centrifuge projects are demonstrated on a reasonable production scale and in order for ERDA to obtain additional SWU's for National Stockpile purposes, ERDA plans to purchase SWU from initial modules (ERDA purchase costs would be budgeted at that time and could be recovered as those SWU's are later used).

MULTIPLE PROJECT FAILURES

Question 3. Is it likely that, if one plant fails, some or all of the others will fail for that same reason?

Answer. After consideration of the relative risks between private enrichers and the Government, several situations have been identified which could result in simultaneous failure of some or all of the projects authorized under NFAA. The identified causes of multiple project failure are: National nuclear moratorium; failure of centrifuge technology to demonstrate commercially viability, and governmental actions such as economically prohibitive enrichment licensing actions.

We believe that the probability of any of these events occurring is so remote as to make multiple project failures from a single event highly unlikely.

COMPETITIVE BIDDING FOR GOVERNMENT TECHNOLOGY

Question 4. Is it possible to provide the government technology to private parties on the basis of competitive bidding?

Answer. Because of the government monopoly in knowledge and experience with the technology, the extreme complexity of the projects under consideration, and the near impossibility of assigning comparative values to the various government assurances required to commercialize the technology it would be extremely difficult, if not impossible, to provide this technology to private parties on the basis of competitive bidding.

Nevertheless the Government has endeavored to encourage competition among those private entities which might be interested in entering the uranium enrichment business.

Since 1971, the Government has instituted policies and programs to encourage private domestic companies to build uranium enrichment plants. Over thirty companies have competed to obtain access to Government classified enrichment information in order to evaluate their participation in the uranium enrichment industry. These classified data, however, have been made available to the companies on a "need to know" basis and therefore has not been available in sufficient depth or distribution to permit the commercial sector, including the financial community, to make a risk evaluation adequate for private firms to price compete for the rights to the classified Government enrichment technology.

It has been evident for some time through extensive hearings before the JCAE on the future structure of uranium enrichment industry, on the Nuclear Fuel Assurance Act and through specific responses to requests for proposals to build enrichment plants that various temporary Government assurances and cooperation would be required by the commercial sector in addition to access to Government's enrichment technology in order to initiate a transition to a private, competitive uranium enrichment industry. The cooperative arrangements currently being negotiated with the four private ventures that have proposed to build enrichment plants will provide for payment of royalties to the Federal Treasury by these private ventures for the use and warranty of the Government enrichment technology. The Government warranties and cooperation will be provided to the private enrichers on a full cost recovery basis.

INCREASE OF REVENUES TO THE GOVERNMENT

Question 5. Would competitive bidding for the rights to government technology increase the revenues to the government as a return on its major R&D expenses?

Answer. We do not believe that bidding on a price competitive basis by private firms for the rights to Government enrichment technology would increase the revenues to the Government beyond the present policy governing the payment of royalties to the Federal treasury by private firms on the basis of 3% of gross sales commercially utilizing the Government's enrichment technology.

Sufficient information on utilization of enrichment technology in a commercial environment is not available on which to base a judgment as to its value for competitive bidding. In addition, the commercial sector has repeatedly indicated the necessity for various Government assurances and cooperation in addition to access to the Government's enrichment technology. These assurances and cooperation are necessary to overcome specific obstacles to commericialization that are also noted in the response to the above question. We have structured our industrial participation enrichment policies and programs to incorporate competition among private firms to minimize Federal budget outlays and yet attain the objective of the NFAA; establishing a private, competitive enrichment industry. Private firms' payment for the use of Government enrichment technology will occur when the technology has demonstrated that it is commercial through royalty payments based on gross sales. In this manner, we conclude that the revenues to the government as a return on its major R&D expenditures will be maximized.

BUDGETING IMPLICATIONS OF NOT ENACTING THE NUCLEAR FUEL ASSURANCE ACT

Question 6. What are the budgeting implications of not enacting the Nuclear Fuel Assurance Act, of maintaining the present Federal monopoly of production enriched uranium?

Answer. With respect to the budgeting implications of not enacting the Nuclear Fuel Assurance Act and maintaining the present Federal monopoly of producing enriched uranium, the following table is furnished. This table illustrates the impact on the Federal Budget of having the U.S. Government build eleven new uranium enrichment plants with staggered start dates beginning in FY 1977 and extending through FY 1990. The table does not consider the cost flow associated with the existing Government plants. The cost and revenue projections, all in 1977 dollars, are based on the following assumptions:

(a) Moderate-low nuclear power growth, with full plutonium recycle, and 0.30 percent U-235 enrichment plant tails assay. It assumes capture of about 45% of the foreign market.

(b) Each plant is assumed to be a nominal 9.0 million SWU capacity with an effective annual sales of 8.75 million SWU/year for purposes of demand tracking.

(c) Construction costs for the add-on diffusion plant (New Plant 1) are latest estimates, based on completed conceptual design.

(d) Construction costs for full size centrifuge facilities (New Plants 2 through 11) are current ERDA estimates of costs for centrifuge plants, assuming that shared sites, maturation of the support industry, and improvements in technology will contribute to capital cost savings over time.

(e) Power costs at 20 Mills/Kwh.

(f) Operating costs based on latest ERDA estimates.

(g) Revenues at an average price of $125/SWU.

FEDERAL BUDGET IMPACT OF GOVERNMENT ENRICHMENT EXPANSION

[In millions of fiscal year 1977 dollars]

	1976	Transition Quarter	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Plant operating costs			10	19	33	46	57	84	336	616	721	846	963
Plant capital costs	4	5	105	349	461	691	1,095	1,337	1,884	1,992	2,214	2,370	2,394
Interest on capital during construction at 6½ percent	(1)	(1)	7	28	58	102	174	265	392	535	699	660	546
Total costs	4	5	122	396	552	839	1,326	1,686	2,612	3,143	3,634	3,876	3,903
Total revenues at $125 per SWU			30	130	269	378	387	317	278	308	805	2,204	3,143
Cash flow:													
Annual	−4	−5	−92	−266	−283	−461	−939	−1,369	−2,334	−2,835	−2,829	−1,672	−760
Cumulative	−4	−9	−101	−367	−650	−1,111	−2,050	−3,419	−5,753	−8,588	−11,417	−13,089	−13,849
Present value at 10 percent:													
Annual	−4	−5	−84	−220	−213	−315	−583	−772	−1,197	−1,324	−1,200	−645	−266
Cumulative	−4	−9	−93	−313	−526	−841	−1,424	−2,196	−3,393	−4,717	−5,917	−6,562	−6,828

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Plant operating costs	1,111	1,261	1,388	1,546	1,711	1,838	1,942	2,079	2,202	2,297	2,405	2,481	2,497
Plant capital costs	2,552	2,318	2,520	2,607	2,313	2,157	2,083	2,009	1,646	1,386	1,090	473	143
Interest on capital during construction at 6½ percent	730	635	561	748	674	587	488	633	510	364	444	239	0
Total costs	4,393	4,214	4,469	4,901	4,698	4,582	4,513	4,721	4,358	4,047	3,940	3,193	2,640
Total revenues at $125 per SWU	4,237	4,327	5,542	6,541	7,489	7,479	8,585	9,545	9,519	10,734	11,733	11,707	11,918
Cash flow:													
Annual	−156	133	1,073	1,640	2,791	2,897	4,072	4,824	5,161	6,687	7,793	8,514	9,278
Cumulative	−14,005	−13,892	−12,819	−11,179	−8,388	−5,491	−1,519	3,405	8,566	15,253	23,046	31,560	40,838
Present value at 10 percent:													
Annual	−50	33	282	392	608	574	733	791	769	903	959	954	946
Cumulative	−6,878	−6,845	−6,563	−6,171	−5,563	−4,989	−4,256	−3,465	−2,696	−1,793	−834	120	1,066

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[1] Less than $1,000,000.

TRANSFER OF URANIUM ENRICHMENT TO PRIVATE SECTOR

Question 7. If you accept ERDA's projections for the growth of nuclear power then clearly an expanding market for enriched uranium exists. After having invested enormous sums of money in enriched R & D for both gaseous diffusion and gas centrifuge methods—why should the Federal government transfer this enrichment activity to private businesses, particularly when uranium enrichment will in the long run provide the government with considerable receipts with which to offset other important ERDA activities?

Answer. The arguments for transferring uranium enrichment to the private sector fall into two chief classes—philosophical and pragmatic—both of which are compelling in our judgment. There is little doubt, we believe, that uranium enrichment of nuclear power reactor fuel would have originated in the commercial sector had it not been for the fact that the Government built large plants for military surpuses. Thus the proper question, we believe, is "why should this activity be retained in the Federal sector?" since:

(a) The process of nuclear fuel enrichment is fundamentally industrial in nature and it employs raw materials supplied by industry and provides its product to the industrial sector.

(b) If there is to be a substantial national reliance upon nuclear power, as most projections suggest, it is important that the supply base for the "bottleneck" step be broadened and made as vigorous and capable of rapidly adjusting to changing requirements as possible. This is best achieved through a competitive industrial framework.

(c) Competition stimulates innovation and efficiency which should ultimately benefit the domestic consumer of nuclear power and increase the potential for foreign sales.

(d) The American system suggests that Government should not provide functions that can be properly performed in the industrial sector.

And on the pragmatic side:

(a) Industry is clearly capable and interested in providing the enrichment service.

(b) Necessary security and safeguards can be maintained to an equivalent degree as for continued Government enrichment.

(c) Foreign investment can be attracted, a factor of very considerable National policy significance.

(d) The taxpayer would be relieved of an enormous and unnecessary investment burden which would not be recouped through sales until around the turn of the century.

(e) Continued Government investment in enrichment facilities beyond that required for the add-on plant inevitably and inexorably restricts and distorts the Budget, and the availability of funding for clearly Governmental purposes. This is particularly significant to ERDA because of upcoming, high priority requirements in the energy area. While it can be argued that "in the long run" the Government would be provided "considerable receipts that could offset other important ERDA activities"—the magnitude depending upon the "profit" that might be achieved from future sales, it is important to recognize that in the short run of the next decade or two, when our needed activities are most clearly evident, precisely the opposite effect would be involved.

(f) The "enormous sums of money" invested in enrichment R & D will be fully recovered through royalty charges; in addition the Government will receive large new tax revenues.

FEDERAL ASSURANCES TO PRIVATE ENRICHMENT VENTURES

Question 8. The fact that enrichment involves classified technology is one reason why it is said that Federal assurances to private enrichment ventures are needed. But private industry deals with classified technology on a daily basis—in the aerospace industry, for example. Surely the classified nature of enrichment technology does not require the ample Federal assurances contemplated in the Nuclear Fuel Assurance Act.

Answer. The problem is not one of private industry dealing with classified technology on a daily basis, but rather the more basic problem that enrichment is a classified, Government-developed technology that has never been applied in a commercial environment before, and of which potential investors have little, if any, first-hand knowledge on which to base sound financial decisions. Thus, the classified nature of the Government-developed technology, coupled with the huge sums involved in these projects makes the temporary assurances envisaged in NFAA essential to the commercialization of this technology.

GASEOUS DIFFUSION PLANT

Question 9. Gaseous diffusion is a mature, 30 year old enrichment technology, to be replaced with the more efficient gas centrifuge technology. Most observers seem to feel that the next enrichment plant should be a gaseous diffusion plant, and ERDA is proceeding to build a new diffusion facility. But the first "cooperative arrangement" contemplated under the Nuclear Fuel Assurance Act will also build a gaseous diffusion plant. Does ERDA really intend to have built *two* diffusion facilities? Does not one of the diffusion plants make the other unnecessary?

Answer. First of all, reference to early replacement of diffusion with "the more efficient gas centrifuge technology" is not yet supported on the basis of technical facts. It is easy to be excited about the potential of the centrifuge process and its prospect for reduced energy consumption but "efficiency" of enrichment processes is ultimately measured by the cost of the product. The competitive relationship of the centrifuge process relative to diffusion remains to be proven; it is most certainly not yet assured that the centrifuge will be the superior competitive process. Only the U.S. diffusion process today represents surety and reliability of supply. It is a National asset which ought not be discarded prematurely.

If it is accepted that the move into private enrichment is desirable, competition in providing private enrichment services should be fostered. Competition is fostered both by the number of enrichers and by the variety of technical processes that can be employed to provide the service. It would be most unfortunate to the Nation if a known process, that may well be competitive to serve an expanding market for many years to come, would be arbitrarily and prematurely excluded from being commercialized. Furthermore a private enrichment industry would compete on the world market.

We believe that it would be a serious mistake not to try to commercialize diffusion especially since foreign diffusion capacity is being made available to foreign customers, and those customers who desire a high assurance of supply should have comparable U.S. option to consider.

The recent rather dramatic increases in uranium prices and a desire to conserve this key resource suggests that existing ERDA enrichment facilities should be operated in a manner which conserves natural uranium feed and improves fuel cycle economics. To do this more enrichment capacity is needed to serve existing ERDA customers. The add-on plant will provide this additional capacity; it will serve existing ERDA customers, not new customers.

For the reasons cited earlier we believe that it is highly desirable, if the requisite number of new customers can be obtained from domestic and foreign sources, that a commercial diffusion project be undertaken. Only the commitment of customers, following passage of the NFAA can determine whether the project can proceed.

ENRICHED URANIUM STOCKPILE

Question 10. Is ERDA now accepting new orders for nuclear fuel? If not what is the purpose of the large stockpile of enriched uranium that ERDA has?

Answer. ERDA's future production capacity has been fully committed under long-term contracts since mid-1974, and therefore ERDA is no longer accepting new long term orders for enrichment services. ERDA is producing a stockpile of enriched uranium in order to provide a contingent reserve to backstop new domestic enrichment capacity in the event they should experience startup problems, plus provide some assurances to existing ERDA customers that their requirements would be met under contingency situations. This stockpile, therefore, cannot be made available to serve additional nuclear reactor projects.

DECISION ON NEW ENRICHMENT CAPACITY

Question 11. Does not the stockpile give us time in which to decide what our enrichment policy should be? The CBO paper on uranium enrichment suggests that it does. The paper also points out that FEA's medium projection of domestic nuclear power demand is lower than ERDA's moderate projection, thereby suggesting that at least a year's leeway exists.

Answer. The Government stockpile does not have any bearing on the timing for a decision on new enrichment capacity. That stockpile, as indicated above, cannot be "tapped" to supply enrichment services to permit a planned delay in bringing on new capacity. Furthermore, the longer a decision on new U.S. enrichment capacity is postponed, the greater the portion of the foreign nuclear fuel market will be captured by foreign competition, and the longer the time until U.S. utilities can firmly commit to nuclear power projects based on contracts with domestic enrichers.

CONTINGENT LIABILITY UNDER THE NUCLEAR FUEL ASSURANCE ACT

Question 12. The Administration believes that the $8 billion in the Nuclear Fuel Assurance Act is a contingent liability and should not be counted as on budget? If that is the case how can the Congress with its new budget procedures score the potential and actual funding—if actual funding turns out to be required—allowed under the act, so that the Congressional budget reflects the full extent of Federal liabilities?

Answer. The contingent liability under the Nuclear Fuel Assurance Act can be scored to enable the Congressional budget to reflect the full extent of Federal liabilities in a manner similar to that in which scoring is done for other contingent or unpredictable Federal liabilities.

For example, the Congress from time to time adjusts the ceiling on the National debt to provide for the changing fiscal needs of the Federal Government. Adjusting this ceiling authorizes the Treasury to borrow money, but does not mandate such borrowing or establish the interest rates which will be paid on funds received. Separate appropriations are made to provide funds to pay the interest on the national debt. If interest rates are higher than allowed for in appropriations, additional funds must be made available to cover the deficiency. If either the amount of borrowing or the interest rate is less than anticipated a surplus will exist at the end of the fiscal year and the surplus will be deobligated.

Another example is funding of unemployment benefits. Appropriations for a fiscal year are made on a projection of unemployment rates. If unemployment is higher than anticipated, additional appropriations will be required. If unemployment rates are lower than anticipated, additional appropriations will be required. If unemployment rates are lower than anticipated, a surplus will exist which can be returned to the Treasury.

Under the Nuclear Fuel Assurance Act, a long-term ceiling on the dollar amount of assurances will be provided when authority to enter in cooperative arrangements under NFAA is appropriated. This will set the maximum that the Federal exposure can reach over a period of years. Each year the Congress will be provided an estimate of the growth in contingent liability for that year. This will enable Congress to score the growth in contingent liabilities under the Nuclear Fuel Assurance Act even though the definitive Congressional action relative to the maximum contingent liability, will be taken only at the time the authority to enter into cooperative arrangements is appropriated.

If, as anticipated, the contingent liability never represents an actual liability, the Congressional budget scoring system can reflect this fact by deducting the amounts which are no longer needed. In the unlikely event that the contingent liability becomes an actual liability, Congress will have previously included the amount of that liability in its cumulative year-to-year scoring.

The following table presents ERDA domestic nuclear energy forecasts with the concomitant enrichment services demand at 0.20% and 0.30% tails assay; and with and without plutonium recycle. It is expected that U.S. enrichers could penetrate the foreign market sufficiently such that enrichment services to meet foreign demand could be as much as the domestic demand. Presently, ERDA has under preparation revisions to the foreign and domestic nuclear power demands.

TABLE 2.—SUMMARY OF DOMESTIC ENRICHMENT (SWU) DEMAND FORECAST: CALENDAR YEARS 1985, 1990, AND 2000

	Total domestic enrichment demand (millions SWU PU-cycle)			
	Yes		No	
	Annual	Cumulative	Annual	Cumulative
I. Moderate-low growth 1975 forecast:[1]				
Calendar year 1985 nuclear capacity (185 GWE):				
Tails:				
0.20 percent	23.1	139.8	26.2	152.8
0.30 percent	18.5	111.3	21.0	121.7
Calendar year 1990 nuclear capacity (340 GWE):				
Tails:				
0.20 percent	39.8	305.1	45.7	341.7
0.30 percent	31.9	243.3	36.6	272.7
Calendar year 2000 nuclear capacity (800 GWE):				
Tails:				
0.20 percent	75.6	903.0	79.2	997.7
0.30 percent	60.7	727.2	63.7	799.3
II. Low growth 1975 forecast:[1]				
Calendar year 1985 nuclear capacity (160 GWE):				
Tails:				
0.20 percent	20.9	122.6	23.2	134.7
0.30 percent	16.6	97.6	18.4	107.2
Calendar year 1990 nuclear capacity (285 GWE):				
Tails:				
0.20 percent	31.9	258.9	37.1	291.4
0.30 percent	25.5	206.4	29.6	232.5
Calendar year 2000 nuclear capacity (625 GWE):				
Tails:				
0.20 percent	55.3	725.3	60.7	811.9
0.30 percent	44.4	580.1	48.8	650.2
III. ERDA 76-1 forecast:				
Calendar year 2000 nuclear capacity (450 GWE):				
Tails:				
0.20 percent	38.7	544.5	42.2	624.2
0.30 percent	30.9	433.1	33.6	499.5

[1] ERDA presently has new forecast near completion.

Note: It is expected that U.S. enricher could penetrate the foreign market sufficiently such that enrichment services to meet foreign demand could be as much as the domestic demand.

GOVERNMENT WILL REALIZE REVENUES FROM SUCCESSFUL PLANT

Question 13. If a plant is successful, how much *revenue* will the government realize from it?

Answer. The government will realize revenues from both corporate income taxes and royalties. Since the private enrichment projects will come on stream on somewhat different schedules, the following illustrates approximately annual cash flow to the Government for each 9 million SWU of capacity.

ANNUAL REVENUES[1]

[In millions of dollars]

Period following startup	Royalties at 3 percent	FIT	Total
1st 8 to 10 yr	27	0 to 100[2]	27 to 127.
Beyond	27	100 to 110	127 to 137.

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[1] For detailed breakdown of these revenues, see the enclosed table showing projected tax revenues and royalty receipts.

[2] The Federal income tax (FIT) flow is eliminated or reduced for some time following plant startup by the application of investment tax credits in accordance with existing tax laws.

The following table shows projected tax revenues and royalty receipts from the Gaseous diffusion enrichment plant contemplated under the Nuclear Fuel Assurance Act. The figures in the table are based on a detailed analysis of the projected pricing, debt structure, operating expenses, equipment depreciation and cash flows for the specific business conditions planned for by the prospective builder of the plant. Similar information is not yet available for the centrifuge enrichment plants. Information on tax revenues is highly dependent on many specific business decisions to be made by a prospective builder. These are decisions such as the debt/equity ratio, depreciation methods, equipment life projection, relative proportions of real property to personal property in the total plant account and many decisions related to accounting practices. This kind of information is not yet available for the centrifuge enrichment plants and so no tax revenues and royalty receipt information can be shown for these plants. However, since the total SWU capacity of the three Centrifuge enrichment plants contemplated under the NFAA is equal to the capacity of the single gaseous diffusion plant, a rough approximation for a combined total may be possible by simply doubling the figures shown in the table.

PROJECTED TAX REVENUES AND ROYALTY RECEIPTS FROM ENRICHMENT FACILITIES CONTEMPLATED UNDER THE NUCLEAR FUEL ASSURANCE ACT OF 1976[1]

[All figures in millions[

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Commercial sales							1	5	9	9	9	9	9	9	9
Sales revenue							427	802	988	978	972	967	962	955	948
Tax revenues	(2)	(4)	(9)	(17)	(39)	(77)	(120)	(48)	11	41	50	59	66	73	80
Royalties (3 percent)							13	23	29	28	27	27	27	26	26
Total to Government each year	(2)	(4)	(9)	(17)	(39)	(77)	(107)	(25)	40	69	77	86	93	99	106
Cumulative total to Government	(2)	(6)	(5)	(32)	(71)	(148)	(255)	(280)	(249)	(171)	(94)	(8)	85	184	290

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[1] Gaseous diffusion plant only.

MARCH 1976

PROPOSED SYNTHETIC FUELS COMMERCIAL DEMONSTRATION PROGRAM

FACT BOOK

UNITED STATES
ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

FACT BOOK

Synthetic Fuels Commercial Demonstration Program

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FACT BOOK

President`s Program
Synthetic Fuels Commercialization

Introduction

The United States dependence on foreign sources of oil and gas continues to grow. Domestic production of oil and natural gas has been declining since the early 1970`s. Even with the development of Alaskan and Outer Continental Shelf oil and gas, improved energy conservation, expansion of nuclear power capacity, and greater direct burning of coal can buy time, our dependence on foreign sources of oil and gas will continue to grow after 1990 if synthetic fuels are not produced in substantial quantities.

The Administration has proposed and is taking where possible a number of actions to deal with the near-term problem of our growing dependence on foreign supplies of oil and gas. These include:

- proposed development of the Naval Petroleum Reserves;
- phased decontrol of domestic oil and proposed price deregulation of interstate gas;
- conversion of selected oil and gas burning power generating stations to coal;
- incentives for conservation through home insulation, auto fuel economy standards, car pooling, energy efficienct appliances, etc.;
- proposed Energy Independence Authority to encourage greater domestic production of supplies; and
- the development of a strategic oil storage system and emergency preparedness measures to deal with potential embargoes.

Successful implementation of these initiatives will, in the short term, help minimize our growing dependence on foreign oil and gas. However, this dependence will continue to grow particularly after 1990. For this important reason, the President continues to propose that we now undertake the first important step toward the development of a synthetic fuels industry--a Federally sponsored Synthetic Fuels Commercial Demonstration Program.

The Proposed Program

The proposed program would encourage the private sector to construct and operate "first-of-a-kind" commercial-scale synthetic fuel plants. These initial plants include:

- shale conversion to synthetic petroleum;
- coal conversion to gas and clean boiler fuels;
- waste conversion to gas, oil and other fuels.

The major objectives of the Synthetic Fuels Commercial Demonstration Program are:

- to gain early information and to initiate development of industry infrastructure by:
    - investigating financing, environemntal, economic, institutional, technical, and other potential problems; and
    - promoting a limited amount of private sector synthetic fuels experience.
- to supplement existing and planned domestic energy production by:
    - reducing reliance on imports; and
    - providing less expensive energy if world oil prices rise.
- to improve U.S. international position in energy matters by:
    - demonstrating U.S. capability to tap its vast resources (see Exhibit A); and
    - establishing U.S. leadership among consuming nations in energy development.

The President is requesting early Congressional enactment of the Program and is requesting supplemental FY 1976 funding for Federal loan guarantees to initiate the first phase of a synthetic fuels commercial demonstration program designed to achieve about 350,000 barrels/day of oil equivalent production by the early 1980's.

This is the first phase of a possible two-phase program which could ultimately encourage up to 1 million barrels equivalent daily production of synthetic fuels in the 1985 time frame. The President has designated ERDA to administer the first phase, 350,000 bbl/day program since it is a commercial demonstration program. When it is enacted, the President's proposed Energy Independence Authority would assume the financing responsibilities for the synthetic fuels program and similar energy programs involving Federal financial incentives.

The remainder of this fact book provides information on the size and content of the proposed program, its scope and method of implementation as well as a discussion of the potential environmental, socio-economic and other impacts of the program, and the measures recommended to limit their impacts.

TAB A

FACT SHEET

Need for Early Commercial Demonstration

A program should be initiated now to encourage the construction and operation of a limited number of first-of-a-kind synthetic fuel commercial demonstration plants. This program is necessary because of the large projected demand for synthetic fuels in the 1990's, the lead time (10-15 years minimum) required to build a new industry, and the present financial and other risks associated with investments in first-of-a-kind commercial-scale synthetic fuel plants. Each of these three points is discussed separately.

- Domestic supplies of oil and gas are projected to decline beginning in the late 1980's. Production of domestic oil and natural gas has already fallen in the last several years and even with deregulation and decontrol, domestic oil and gas supplies would only be sufficient to limit further growth in imports for another 5-10 years. Even using advanced oil and gas recovery techniques and extensive production from the Outer Continental Shelf and Alaska, imports would continue to rise substantially if synthetic fuels were not available in substantial quantities by 1990's.

- The projection that synthetic fuels will be needed in substantial quantities in the 1990's is based on realistic estimates of domestic production of oil and gas and also assumes substantial growth in nuclear power as well as optimistic projections of the contributions from energy conservation and from alternative supply sources such as solar and geothermal. If any of these domestic energy supplies fails to provide its expected contribution, then the need for synthetic fuels could be more than the currently estimated demand for 1995 (5 million barrels per day).

- Initiating a synthetic fuels industry to be financed in the private sector and capable of providing about 5 million equivalent barrels/day of production capacity (i.e., about 100 major plants) by 1995 will require an early "commercial demonstration program" to resolve a number of uncertainties related to regulation, environment, financing, labor, economics, and transportation. These uncertainties must be resolved by the middle 1980's in order to enable adequate plant investment in the late 1980's. Thus, the lead times involved require the construction and operation over the next 5 to 10 years of a representative mix of synthetic fuels plants to obtain all the necessary data and information needed prior to a major industry expansion.

- There are at the present time a number of serious impediments to private sector commercialization of synthetic fuels. The uncertainty in the future prices of world oil is an important factor discouraging private investment. If world oil prices were to fall substantially, forcing synthetic fuel prices down with them, large plant investments could not be paid off from revenues of low price, but initially high cost, synthetic fuels. In addition to the large plant capital risks, there are numerous environmental uncertainties, regulations that must be met, and uncertainties concerning the adequacy of available labor and materials. Federal Government involvement is needed to reduce the risks posed by these uncertainties.

TAB B

FACT SHEET

Need for Federal Assistance

Although there are many commercial-scale synthetic fuel plants in various stages of planning and design, none has yet proceeded to construction or has even obtained firm financing. The general reason for this is that there are, at the present time, large financial risks associated with constructing these "first-of-a-kind" commercial demonstration plants even though in some cases the fuels produced from these plants are expected to be competitive (e.g., shale oil) or are in great need (e.g., synthetic gas).

Specifically, the major reasons why industry has not, and is not likely in the next few years to make large synthetic fuel plant investments are:

- The present uncertainties about the future costs of synthetic fuels. Although in almost all cases, the technologies that would be included in this program are well known and have either been domestically demonstrated at the pilot plant scale or at larger scale outside the U.S., there are still uncertainties about the product costs due to inflation, timely availability of labor, equipment and raw materials and potential scale-up problems that may arise in constructing a "first-of-a-kind" plant.

- Uncertainty in the future competitive price of world oil. The product of a large synthetic fuel plant, such as an oil shale plant, must compete in a managed market against world oil. If the investor in a $1 billion plant does not have good assurance that the product of his plant can be sold at a price which will allow amortization of his debt plus a reasonable return on investment, then no investment will be made. If the OPEC producers drop the world oil price, even if temporarily, this could cause a default on plant debt. Thus, even though shale oil may be priced at 13-14/bbl. which is competitive with today's world oil price, there is no assurance to the investor that it will be competitive over the next 5-10 years. As world oil supplies decrease in the late 1980's to the point where world oil price will be governed by supply/demand relationship and not by cartel pricing policies, it is expected that synthetic fuels will become increasingly competitive.

- Large capital risks relative to company assets. The net worth of many of the companies which might sponsor synthetic fuels plants are not large compared to the investments required for the plants. This is especially the case for gas pipeline companies, the largest of which has a net worth of less than $1 billion which is less than required capital investment for a $1 billion synthetic gas plant. Even for large companies such an investment is significant and would be made only if there were reasonable assurance of a favorable return on investment. For the largest companies, raising the required capital for a project which is sound is not a problem, the problem with synthetic fuels ventures is they are relatively more risky than other potential energy and non-energy investments.

- Risk of major project delays. Another reason industry is reluctant to make large synthetic fuel plant investments is the risk of major project delays during construction or start-up due to environmental, regulatory or other reasons. Since no synthetic fuel project has been completely through the regulatory processes, there is uncertainty about the nature and extent of potential delays.

In summary, without Federal financial incentives, it is unlikely that significant quantities of synthetic fuels will be produced by 1985. Without such production, many uncertainties associated with the viability of synthetics cannot be resolved, thus permitting large scale private investment for production capacity by the middle 1990`s.

TAB C

FACT SHEET

Information Gained from the Synthetic Fuels Program

Since the early 1950's, U.S. efforts related to synthetic fuels development concentrated on pre-commercial R&D efforts concerned primarily with coal conversion and surface retorting of shale. Over the past five years a number of refinements to these technologies have taken place. These evolutionary developments, however, still remain untested at commercial scale in the U.S. Because of the significant capital costs involved, the regulatory uncertainties and the unknowns concerning OPEC cartel pricing policies, investors are reluctant to assume the large risk associated with first-of-a-kind commercial-scale synthetic fuel plants. The proposed Synthetic Fuel Commercial Demonstration Program is designed to reduce the risk to investors in the initial plants while at the same time providing valuable information on the environmental, economic, institutional and other factors which will influence the initiation of a synthetic fuels industry. This information is vital in formulating U.S. energy policy since a determination should be made in the next 5 to 10 years as to whether synthetic fuels can, in fact, offer a significant alternative to foreign sources of oil and gas beginning in the later 1980's.

If, as projected, a U.S. synthetic fuels industry capable of providing about 5 million equivalent barrels/day of production capacity (i.e., about 100 major plants) will be needed by 1995, the proposed commercial demonstration program is required in the immediate future. This is due to the need to resolve the economic, environmental, regulatory and other uncertainties by the middle 1980's in order that adequate plant captial investment can be made in the later 1980's to achieve significant synthetic fuel produciton levels prior to the turn of the century. Thus, the lead times involved require the construction and operation within the next 10 years of a representative mix of commercial-scale synthetic fuel plants to obtain the necessary data and information related to commercial viability.

The first phase of the program would involve the construction and operation of about 12-17 commercial demonstration plants using different energy resources (e.g., coal, oil shale, municipal wastes) and technologies that would result in a total synthetic fuel production capacity of an equivalent of about 350,000 barrels/day of oil. Specifically, the information to be gained and deemed to be necessary to facilitate the commercial introduction of either first or second generation synthetic fuels technologies includes:

1. Engineering Plant Operations Data

The main differences expected in terms of information obtained from commercial-scale operations as opposed to demonstration/pilot program levels include:

- Continuous plant operations

  Commercial-scale plants involve continuous plant operation which provide information on integrated component durability and lifetimes; whereas, pilot and demonstration operations are characterized by many short runs that test the technology. Also, continuous commercial-scale operations will verify product quality and uniformity which is particularily significant for liquid products such as oil from shale.

- System reliability/operability

  A commercial-scale plant is typically operated by crews largely composed of skilled or semi-skilled workers -- not engineers. A pilot or demonstration plant is usually more extensively instrumented to obtain technical and engineering data and is operated by a crew that has an unusually large percentage of technical and professional skills. The reliability of a commercial plant as an ongoing system can be more confidently estimated from data gained during typical commercial plant operations than from the atypical testing procedures and personnel used in pilot and demonstration plant operation.

- Occupational health and safety data

  Normal operating procedures of a commercial-scale plant will give realistic information that could not be gained from small-scale pilot or demonstration operations.

2. Environmental and Socio-Economic Information

A pilot or demonstration plant allows for estimating pollutants emitted from larger size plants. Yet, it is only through the construction of commercial size facilities that reliable information can be obtained about the combination of environmental impacts. Such facilities would demonstrate the combined impacts of the plant itself, large population migrations (with attendant demands on air, water, and community services), as well as providing the opportunity to formulate effective measures for controlling these impacts to acceptable levels.

- Air Quality

  Commercial scale plants are required to design and test effective control measures to minimize air pollution and meet applicable air quality control standards. Furthermore, commercial-scale plants will be needed to provide a sound basis for determining new source performance standards.

- Water Quality

  It is currently expected that synthetic fuels plants will contain total water reuse systems and will have zero discharge to surface or ground waters. A full scale commercial facility is necessary to see if, in fact, this system can be implemented. Additionally, for oil shale operations there are many uncertainties concerning the impacts on water quality of mining and reclamation. The small scale tests that have already been carried out have not resolved these uncertainties because the size of the effected region is too small to model a large-scale operation realistically.

- Land Disturbance

  Huge spoil piles that result from coal surface mining operations can be regraded to approximate the original contour and vegetative cover can be reestablished. The revegetation steps, however, are presently at an experimental stage. Commercial scale synthetic fuel facilities requiring coal and oil shale mining operations will provide opportunities for extensive, realistic field experiments to confirm the results of research already being sponsored on a small scale by the U.S. Environmental Protection Agency and the U.S. Department of Agriculture.

- State and Local Socio-Economic Impact

  A commercial size coal gasification or oil shale plant might require a total worker and family population of about 20,000 during the construction period and about 10,000 during normal operations. Should this population have to move into a remote area, additional investments in community facilities for increased water supply, sewage and solid waste treatment, fire service, recreation, police and health services, etc. would be required. Since the Synthetic Fuels Commercial Demonstration Program would contain community planning and impact assistance provisions, valuable experience would be gained in effectively dealing with these impacts in the future at a minimum risk to the affected community.

3. Plant and Mining Facility Economic Data

Small scale pilot or demonstration projects are designed mainly to answer questions associated with the "workability" of the technology. In general, economic data related to final product costs are of lesser importance in such sub-commercial scale operations. Large scale (commercial) projects, on the other hand provide a basis for obtaining a range of economic information:

- Capital Investment Costs

  The construction of a commercial scale plant and its associated ancillary facilities (i.e., mine, product distribution system, etc.) will provide reliable information on capital costs thus enabling preliminary rate-of-return estimates based on smaller scale projects to be validated or improved.

- Operating and Maintenance Costs

  Operating commercial scale plants on a continuous basis as opposed to a pilot/demonstration plant which typically operate intermittently, allows ongoing operating and maintenance schedules to be examined in order to establish the most efficient (least cost/technological and environmentally sound) procedures. Potential cost reductions in operations will have a significant impact on the eventual competitiveness of synthetic fuels.

- Economies of Scale

  In general, large industrial plants experience decreasing costs per unit of output as plant size increases. These economies are usually related in a non-linear fashion to the level of production. The magnitude and range of output over which these economies of scale pertain to synthetic fuels plants can only be accurately determined by commercial-scale operations.

- Comparative Economies of Competing Technologies

  Significant differences in final product prices among competing technologies (e.g., Tosco, Union or Paraho oil shale retorting technologies) can be established only as the price relationships are verified in scaling up to commercial plant sizes.

- Overall Economics of Venture

  In addition to information on the direct cost of construction and plant operation, other cost information essential to product pricing can be obtained from commercial-scale operations, e.g., transportation costs, reclamation costs, marketability of by-products, impact of regulation etc., can be examined. Information on these costs cannot adequately be obtained from small-scale pilot or demonstration projects since the plants are not designed to examine the economic viability of an integrated industrial complex.

- Advanced Mining and Feed Systems

  Related to economies of scale is the adoption or development of more sophisticated, higher output mining and feed systems most especially in the area of oil shale mining. Gaining operational information on advanced mining operations on a commercial scale for synthetic fuel plants will make future adaption periods much smoother, reducing costs and the time to attain efficient plant capacity utilization.

4. Project Financing Information

- Investment Uncertainty

  Commercial demonstration projects will provide much of the information necessary to remove or mitigate uncertainties that presently inhibit investment in synthetic fuels plants. Removal of these uncertainties will most likely result in establishing the commercial viability of the processes involved. This will resolve financial community (equity investors and lenders) uncertainties and will permit the private sector in the mid 1980's to analyze more accurately investment risks and to make better investment decisions regarding synthetic fuels. Without realistic commercial scale operations, it is doubtful the financial community would be convinced that synthetic fuels technologies represent reasonable investment opportunities.

- Private Sector Financing Experience

  Unlike pilot and demonstration plants which are financed as R&D investments either entirely with Federal funds or through a combination of Federal and participating company funds, the plants to be constructed under the ERDA commercial demonstration program would be financed in the private sector although partially guaranteed by the Federal government. The essential difference, however, is that valuable experience in financing these new projects will be gained both by the lenders involved and by the project sponsors.

5. Product Distribution and Marketing Information

- Product Substitution

  Commercial demonstration projects should be designed, in part, to assist in the establishment of the acceptability of the projects, including determintion of their competitive posture in the marketplace, and to expose any anomalous marketing characteristics. This information will arise from the requirement that the large commercial quantities being produced by the plants will have to be marketed and sold in markets where they must compete with their naturally derived counterparts and other proposed substitutes. This is typically not the case for smaller quantities of products produced through pilot and demonstration plants.

6. Regulatory Information

- Federal and State Requirements

  One of the major information benefits of the synthetic fuels commercial demonstration program will be derived from having synthetic fuels projects complete the applicable Federal and state regulatory processes. Although many regulatory requirements apply to smaller demonstration plants, such realistic regulatory issues as Indian lands and resources, rate proceedings before the Federal Power Commission and state regulatory authorities will only be examined with commercial-scale plants. Finally, substantial questions regarding the implications of state regulations will require early resolution before commercial investments will be made.

7. Water Requirements Data

- Water requirements for coal and oil shale mining operations are almost exclusively for dust control and land reclamation. Many synthetic fuel plants will also require substantial quantities of water as a feed stock or raw material. While supplying large quantities of water may not present serious problems in the East, water is scarce in many parts of the West. Commercial operations in the West will, in many instances, require deep well drilling to obtain the necessary water from acquifers, whereas from small scale pilot or demonstration plants enough water can be obtained from surface sources. The effect of such water withdrawals on aquifer recharge rate presently is unknown.

8. Information Concerning Public Acceptance

- An important category of information for potential future investors in synthetic fuels plants is whether such plants will be publicly acceptable. Experience in the electric power area has demonstrated that this issue is an important determinant in utility decision making. By constructing and operating a variety of commercial-scale plants, significantly better information will be obtained concerning the likely outcome of the public acceptance issue as it applies to the various synthetic fuel categories.

9. Manpower & Equipment Needs

- Pilot or small scale demonstration projects operate at levels for which unique equipment or non-professional skilled manpower requirements are minimal. On the other hand, a commercial demonstration project generally requires a wider range of equipment and a large number of non-technical and engineering manpower skills. For example, to produce 50,000 bbls/day, a shale oil complex will mine some 65 to 70 thousant tons of shale per day utilizing current technology. This is more than three times the output of present day large scale coal mines. The scaling-up of the equipment, general operational reliabilities, and magnitude of the operation required to extract, transport, and process this amount of shale can only be verified by actually developing a commercial-size operation. Similarily, the technical skills to operate a large, integrated and first-of-a-kind industrial complex can only be developed gradually and under commercial scale conditions.

TAB D

FACT BOOK

Description of Proposed Program

The President has proposed a goal of assuring the production of up to 1 million barrels/day oil equivalent of synthetic fuels by 1985. This goal has led to the development of a contingent two-phased program.

The first phase of the program is designed to demonstrate the technical, economic and environmental feasibility of commercial-scale plants using available technologies. This phase involves the construction and operation of about 12-17 commercial-size plants using different energy resources and technologies and resulting in a total capacity of about 350,000 oil equivalent barrels/day. The President recommended proceeding with this phase and is requesting the Congress to permit its implementation.

Decision to proceed to a second phase of the program is not anticipated until the 1979/1980 time frame and will depend on:

- more information on environmental and other impacts;
- results of ERDA`s second generation technology R&D efforts in terms of modifications permitting lower cost production.
- better information on the world energy situation; and
- industry response to Phase I.

The first phase of the synthetic fuels program includes:

- providing on a competitive basis, limited financial incentives to the private sector for commercial demonstration plants to overcome existing financial uncertainty;
- expediting, through administrative action, the necessary Federal regulatory permits and clearances;
- providing financial guarantees or assistance to localities for needed socio-economic infrastructure planning and development;
- ensuring rigorous environmental protection through an environmental protection strategy; and
- assuring that the technology utilized in the initial commercial demonstration plants will be made available to all interested firms at a reasonable cost.

The commercial demonstration program would include a mix of plants and technologies designed to provide maximum information on the operation of synthetic fuel plants. A possible plant technology/resource mix and production capacity for the program is:

Type of Plant	Possible Number	Est. Production Capacity-Each Plant (bbl/day oil equivalent)	Affected Industry
• High BTU Coal	3	up to 40,000	Pipeline gas
• Oil shale Conversion	2-3	up to 50,000	Petroleum
• Substitute Fuels Utility/Industrial	4-6	up to 25,000	Utilities/ Industrial Users
• Biomass Conversion (Gas/Liquid)	3-5	up to 6,000	Various
Totals	12-17	up to 350,000	

The actual plant sizes and number of plants may vary somewhat depending on the proposals received from interested firms and the estimated environmental impacts.

Recommended Financial Incentives

The proposed approach is to encourage the construction and operation of these plants by providing limited financial incentives to the private sector. The government would also administratively assist firms in securing Federal regulatory permits and clearances required for synthetic fuel plants.

The form of financial assistance to be provided under the program varies by the type of plant and whether the affected industry is regulated or nonregulated. The basic proposed forms of financial assistance to be offered are loan guarantees, price guarantees and construction grants. For each type of synthetic fuel plant, a specific type of incentive(s) will be provided to at least partially remove the financial and market risks associated with plant construction and operation. The proposed approach is to share the underlying risks between the developer, the government, and the consumer. The risk sharing approach is designed to minimize, to any single party, the catastrophic financial effects entailed in failure of a plant which may cost in excess of a billion dollars. A competitive award process is planned. The evaluation of offers to build a synthetic fuels commercial demonstration project will include consideration of the amount of Federal assistance required by the offerer.

The following table summarizes the incentives identified as appropriate for each plant type:

Plant Technology	Affected Industry Regulated/Nonreg.	Construction Incentive	Operating Incentive
• High Btu Gasification (pipeline gas)	Regulated	Non-Recourse loan guaranty of up to 75% of estimated project cost	Not necessary if regulatory ruling permits cost of service recovery
• Oil Shale and Unregulated Utility/Industrial Fuels Conversion	Nonregulated	Non-Recourse loan guaranty of up to 50% of estimated project cost	Price guaranty
• Utility/Industry Substitute Fuels	Regulated	Construction grant of up to 50% of estimated project cost	Not necessary if regulatory ruling permits cost of service recovery
• Biomass Conversion	Nonregulated	Non-Recourse loan guaranty of up to 75% of estimated project cost	None

Each incentive combination is designed to provide enough Federal assistance to encourage plant development. Each combination also requires considerable financial commitment by a private firm.

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• Utility/Industry Substitute Fuels	Regulated	Construction grant of up to 50% of estimated project cost	Not necessary if regulatory ruling permits cost of service recovery
• Biomass Conversion	Nonregulated	Non-Recourse loan guaranty of up to 75% of estimated project cost	None

Each incentive combination is designed to provide enough Federal assistance to encourage plant development. Each combination also requires considerable financial commitment by a private firm.

TAB E

Relationship of RD&D Program to Commercial Demonstration Program

ERDA has, as a major aspect of its non-nuclear energy activities, the development of alternative technologies to reduce America`s dependency on diminishing domestic supplies of oil and gas. Such technologies would make use of coal and oil shale, as well as organic wastes, and would result in the conversion of these materials into clean synthetic fuels including gas and oil. The demand for synthetic fuels in the U.S. for the middle 1990`s is projected to be about five million equivalent barrels/day of production capacity. If synthetic fuels are not available in such quantities by the 1990`s, imports would continue to rise substantially.

Because of the long lead times required to design, construct, and bring into operation commercial-scale synthetic fuel plants, and because of the need to have a substantial production capability for synthetic fuels in place in the 1990`s, there is a need to proceed in parallel with two kinds of activity. The first is ERDA`s Fossil Energy research, development, and demonstration program which is associated with advanced or second-generation synthetic fuels technologies. These second-generation technologies are not as yet sufficiently mature to be the basis for commercial-scale plants, although it is eventually expected that they will be economically superior to present technology. The second kind of activity is commercial-scale demonstration of first-generation or available technologies in order to gain early information and experience for the industry and investment community related to the commercial viability of synthetic fuel ventures. (See TAB C for a more complete discussion of the information to be gained from this program).

These two kinds of activity are very different: the first emphasizes scientific and technical feasibility of components and processes, while the second emphasizes resolving economic, environmental, regulatory, social and other uncertainties which inhibit early commercialization.

From an operational standpoint, the programs differ in the following respects:

- ERDA`s Fossil Energy RD&D program will be funded on a cost-shared basis with industry and will result in the construction and operation of single module demonstration plants using advanced technology components near commercial scale. The cost-sharing approach is used because of the greater technical risk associated with advanced technology demonstration plants and the need for the government to reduce the costs to industry of such projects.

- The proposed Synthetic Fuels Commercial Demonstration Program would be operated primarily with loan and price guaranties and, in general, would result in the construction and operation of commercial plants with several modules of commercial-scale equipment. The guarantee approach is recommended because of the lower technical risk, although there are still substantial financial risks associated with first-of-a-kind commercial-scale plants. (See TAB B for a more complete discussion of these risks and TAB F for a discussion of the recommended financial incentives).

TAB F

FACT SHEET

Rationale for Recommended Incentives

The recommended financial incentives were arrived at after consideration of the overall goal and objectives of the commercial demonstration program. Specifically, the goal of accelerating synthetic fuel production in the 1976-1985 time frame can only be met with incentives that address the financial economic and regulatory uncertainties that currently constrain investment in synthetic fuels by private industry.

The financial incentives considered included loans, loan guaranties, purchase agreements, price guaranties, construction grants, government ownership, and tax changes including investment tax credit, construction expensing and accelerated depreciation. The criteria used to compare the incentives were:

- expected cost to the government;
- effectiveness in assuring target production;
- breadth of industry participation and competitiveness;
- minimizing Federal management involvement;
- complexity in administering the incentives;
- flexibility in program size and scope; and
- existence of necessary statutory authorities.

In general, it was concluded that:

- The price guaranty is the least costly and most effective way to overcome the uncertainty of future price competitiveness.
- The loan guaranty is the least costly and most effective way to share the front-end capital risk.
- The construction grant was needed in the electric utility sector because of debt financing restrictions.

For each synthetic fuel category, a consistent methodology was used to assess the economic barriers to investment and the associated need for financial incentives, to develop alternative incentives, to evaluate these alternatives and to select the optimum incentive. The following constraints to private sector investment in synthetic fuels were determined:

- Synthetic Oil. Except for the very largest firms (i.e., major oil companies, etc.), capital availability is a substantial barrier. Risk to capital or an inadequate or uncertain return on investment is a major concern for all potential producers. Note that only unregulated firms were determined to be viable potential producers of these synthetic fuel types (e.g., shale oil).

- Synthetic Natural Gas. All producers would be subject to price regulation by the Federal Power Commission. Accordingly, the ability to pass production costs through to consumers mitigates the constraint of return on investment. However, capital availability and exposure are significant barriers to investment for all potential project sponsors, most of which are regulated gas pipeline companies.

- Utility Fuels. Potential producers of these synthetic fuels are also regulated, and the return on investment barrier, again, is mitigated somewhat by the ability to pass costs through to the consumers. Synthetic utility fuels may in many cases cost more than the fuels they displace and the required consumer electric rate increases present potential problems with regard to regulatory approval of such projects. Capital availability has in the past been also a significant problem for potential producers of this synthetic fuel type.

- Industrial Fuels. Capital availability and exposure are major barriers to all except the very largest of these producers. The risk of inadequate return or profitability is also a constraining factor for potential producers in this sector.

Thus, the major financial risks are of two types:

- Front-end or capital risk associated with a plant failure or with a long delay which results in loan default and loss of capital.

- Price uncertainty associated with uncertain future price of world oil.

The overall assessments and the recommended incentives are shown by size of firm and by fuel type in the following table.

INDUSTRY CONCERNS AND INCENTIVE RECOMMENDED

	Financial Needs			Recommended Incentive Competitively Awarded
	Capital		Return on Investment	
Synfuel Category	Availability	Exposure		
Synthetic Oil	Not Regulated			Non-Recourse loan guaranty of up to 50% of estimated project cost.
• Major Firm	-	-	x	
• Middle Size Firm	x	x	x	
• Independent Venture	x	x	x	
• Small Firm	x	x	x	
Synthetic Natural Gas-Regulated Biomass-Not Regulated				Non-Recourse loan guaranty of up to 75% of estimated project cost.
• Major Firm	x	x	-	
• Middle Size Firm	x	x	-	
• Independent Venture	x	x	-	
• Small Firm	x	x	-	
Utility Fuels	Regulated			Construction grant of up to 50% of estimated project cost.
• Major Firm	x	-	-	
• Middle Size Firm	x	-	-	
• Independent Venture	x	x	-	
• Small Firm	x	x	-	
Industrial Fuels	Not Regulated			Non-Recourse loan guaranty of up to 75% of estimated project cost.
• Major Firm	-	-	x	
• Middle Size Firm	x	x	x	
• Independent Venture	x	x	x	
• Small Firm	x	x	x	

x serious constraint
- not a constraint

Illustrative Example - Competitive Bidding

The following example for an oil shale plant illustrates the use of the loan and price guaranty incentives and the competitive bidding approach envisioned under the proposed program.

The United States Government (USG) would solicit offers from interested and qualified firms. The amount of loan guaranty and the market price guaranty level that each firm proposes is expected to vary. If an oil shale plant were estimated to cost $1.5 billion, a firm might propose a loan guaranty to 50% of project cost or $500 million and a market price guaranty level of $12 per barrel. Another firm may propose no loan guaranty but a market price guaranty level of $15 per barrel. The meaning of a price guaranty level of $15 is as follows: Should the market price of oil fall below $15 per barrel, say to $12, the USG would pay the firm $3 per barrel for each barrel produced. Should the market price rise to $17, then the USG would pay nothing and receive as revenue a portion of the $2 in excess of the agreed-to guaranty price.

An evaluation of the expected net present value (cost) to the USG when combined with other factors characterizing the proposals would indicate which was of greatest benefit to the nation. Under the arrangement for loan guaranties for part of the project cost arrangement, the private sector company has a substantial investment of its own resources. The USG would select the best offer(s) based on least cost and on the objectives of the program. Under the proposed incentives, the USG mainly guarantees against plant failure and market price uncertainty. The USG would pay only if the plant failed or the market price of oil remained below the guaranty price. The USG would have recourse to the plant assets should a default occur but not to the assets of any parent company. It is important to recognize that the private sector will have substantial investments in funds, personnel, technology and expertise in each plant that would be a loss should the plant fail.

TAB G

FACT SHEET

Program Budget Estimates - Synthetic Fuels Commercial Demonstration Program

Estimating the exact expected cost and corresponding budgetary authority necessary for the commercial demonstration program is complicated by the long-term nature of the synthetic fuel plant construction and operation (25-30 years) and by other significant uncertainties including:

- the future foreign/domestic market prices of oil and gas;
- the cumulative effect of inflation over this time frame;
- the overall success/failure rate of the plants.

In view of these uncertainties and the need to develop "best possible" estimates for the program, a rigorous financial analysis effort has been completed. This analysis included:

- detailed plant cost estimates for the various technologies
- detailed social infrastructure development cost estimates based on estimated increases in population in a locality attributable to the synthetic fuel plants
- use of a series of computerized cost models for each plant type with flexibility to change plant mixes to evaluate differing programs and the capacity to estimate capital as well as operating phases for each plant
- the capability to alter key assumptions for future market prices, inflation rates, plant and operating costs and the cost of energy resources used by the conversion technologies.

In the process of developing budgetary estimates, numerous program cost scenarios were estimated by changing assumptions for the market price of oil, inflation rates, cost of coal resources. Extreme scenarios were calculated based on pessimistic assumptions, e.g., market price of oil $7 per barrel. As a result of the many differing calculations, recommended budgetary requests have been formulated that are adequate for the program and will be ample to cover most unforeseen contingencies. The estimates are for the full term of the program and unless extremely adverse developments occur, the authorizations will be adequate to complete the program. It must be recognized that the budgetary authorization estimates do not represent actual cost to the government but rather reasonable estimates of funding authority necessary to implement the program.

Authorizations

Exhibits 1 and 2 show the individual plant cost estimates by type of plant including social infrastructure costs and the estimated number to be included in the commercial demonstration program. The basic assumptions used in developing these estimates are enumerated on the Exhibits. The anticipated levels of funding authorizations for loan guarantees, price guarantees and construction grants are shown at the bottom of the Exhibits and derived directly from the plant cost and operating estimates.

The President is requesting an initial $2 billion in loan guaranty authorization for FY 1976 to initiate the program in ERDA. The remaining funding authorization for loan guarantees and for price guarantees is contained in the Administration`s funding request for the Energy Independence Authority for FY 1977. In the event EIA is not enacted in 1976, ERDA would need an additional authorization of $4 billion in loan guarantees and would request price guarantee and grant authorization on a project by project basis. In that event, the following authorization levels will be needed to allow execution of Phase I of the Synthetic Fuels Commercial Demonstration Program:

Loan Guaranty..................	$6.0 billion
Price Guaranty.................	4.5
Construction Grants............	.6
Total Budgetary Authority....	$11.1 billion

Up to $425 million of the $6 billion authorization might be needed for guaranty of debt service for municipal financing of necessary social infrastructure caused by substantial increases in local population because of a synthetic fuel plant. Under this proposal the ERDA Administrator would be given the authority to guaranty debt service of municipal bonds that are necessary to finance the construction of essential capital facilities (e.g., sewers, water, public safety) to service the influx of new population caused directly by the synthetic fuel plant. A detailed description of this proposal is contained in the Socio-economic Impact Assistance fact sheet. (Tab O)

In order for the government to proceed with the complete program, the requested authorizations are needed prior to the execution of any agreements with the private sector. However, certain plants can be initiated with only a loan guaranty authorization.

While the total authorizations requested for the program exceed $11 billion, the actual cost to the government of the program is expected to be a small fraction of the requested authorization because:

- most loan guarantees are expected to be repaid and at least a portion of any defaults will be covered by fees charged for the loan guaranty and sale of any project assets that are recovered.

- actual price guaranty payments are likely to be significantly lower than than the requested authorization if the world price of oil continues to increase, which is likely.

Costs to the government will be incurred for the construction grants up to $600 million and for expenses to administer the program estimated at $10-$15 million annually. The possible cost to the Government for the program over its 20 to 30 year life is about $2.1 billion (Exhibit 5).

Borrowing Authority/Appropriation Approach/Estimates

Although there is a good possibility that loan guarantees and a somewhat lesser possibility that price guarantees will never result in the expenditure of Federal funds, the ERDA Administrator must, in order to make the recommended guarantees credible and effective, have the full authority to outlay funds in the very unpredictable circumstances when they may become needed. To accomplish this purpose, it is proposed that the ERDA Administrator be provided with a limited, renewable authority to issue notes or other obligations to the Treasury should payments be required in connection with either loan or price guarantees.

The authority to borrow from the Treasury to make payment, if required, for guarantees, was selected in favor of no specific appropriation authority or an advance appropriation arrangement for several reasons including:

- Credibility. It is important for the ERDA Administrator to have, in advance, a clear-cut authority to make payments in the event of either default or on account of the requirements of price guarantees. Such authority is necessary to remove the uncertainty on the part of investors about the timeliness of payment and/or the USG intent to pay.

- Continuity. Default or price guaranty payments are not likely to occur for a number of years.

- Surety. The precise amount of such payments are difficult to estimate and may not occur if favorable conditions result in the future.

In view of these factors, giving the ERDA Administrator limited authority to issue debt, if and when the need arises, is the most expeditious and efficient means of financing the program. Repayment of ERDA`s obligations held by the Treasury would be accomplished through subsequent specific Congressional appropriations.

The Administration will transmit to the Congress separate appropriation requests for the borrowing authority consistent with the terms of the Budget Reform Act.

The following basic factors were considered in assessing the amount of borrowing authority needed:

- Time-phasing of project starts over the 1977-1979 period.
- Likelihood of projects simultaneously defaulting on loan guarantees and likely cost of default to the government.
- The expected future market price of oil and gas and any indicated price guaranty disbursements.
- The 20 to 30-year economic life of the synfuel projects.
- The need for flexible and credible program administration as well as periodic accountability to the Congress.

After analyzing these factors, it is recommended that $1.5 billion in loan guaranty borrowing authority be provided to cover possible loan default costs. ERDA debt outstanding under this authority could not exceed $1.5 billion at any time. Outstanding debt would be repaid by the ERDA Administrator by obtaining specific appropriations. This amount is 25% of the gross Federal loan guaranty liability of $6 billion (Exhibit 3). Although default costs could exceed 25%, it is very unlikely that this would occur before Congress had the opportunity to repay ERDA`s debt to the Treasury. The $1.0 billion borrowing authority recommended for price guarantees will provide for about 3 years of price guaranty payments under the very pessimistic assumption that oil prices fall to $7 per barrel. Should recent trends continue for the price of oil, it is unlikely that any price guaranty payments will be made.

Construction grants are different from loan and price guarantees because they will require budgetary expenditures. A straightforward appropriation request will be made for this incentive. Consequently, even though construction grant outlays are not anticipated during FY 1976 because of the lead time in incurring construction costs, the full authorization of $600 million in grants is expected to be needed to enter into contractual agreements during FY 1977 even though outlays will be spread over a number of subsequent years.

In the event EIA is not enacted and the program were funded in ERDA, the following borrowing authorities and appropriations would be needed:

Loan Guaranty....................	$1.5 billion
Price Guaranty..................	1.0
Total Borrowing Authority.....	$2.5 billion
Construction Grants.............	$ .6 billion
Total Appropriations..........	$3.1 billion

The program's five-year projections for construction grants, administrative costs, and guaranty fees are shown in Exhibit 4.

Exhibit 1
Phase I Program Budget Authorizations
($ million, statistics include 7% annual inflation)

Plant Type	Number Scheduled for 1976-1978	Total Capital Invested	Construction Phase		Operation Phase
			Loan Guaranty	Construction Grant	Price Guaranty
High BTU Gas (regulated)	3	2,700	2,000	-	-
Shale Oil (unregulated)	2	2,100	1,050	-	900
Utility/Industrial Fuel (unregulated)	2	1,300	650	-	3,600
Utility Industrial Fuel (regulated)	2	1,000	-	500	-
Biomass (regulated & unreg.)	5	1,200	900	-	-
Social/infrastructure asst.			425		
CONTINGENCY			975	100	-
TOTAL BUDGET AUTHORIZATION REQUESTED			6,000	600	4,500

Specific Key Assumptions:

- Assumes recommended incentives of 50% loan guaranty for unregulated utility/industrial fuel, and oil shale plants; 75% loan guaranty for biomass and high-BTU gas plants; and price guaranties for shale oil and unregulated utility/industrial fuel. Should higher than recommended percentages for loan guaranties be necessary, the Contingency Reserve could accommodate.
- All statistics include 7% annual inflation rate for capital and operating costs.
- Total project investment is based on a 7-year development schedule for all plants, except for biomass conversion which are expected to be completed in a 3-year period. Plants are assumed to have a 20-year operating life.
- Investment totals do not include costs of such auxiliary developments as coal mines, roads, pipelines, etc., which, if they occur, could be accommodated by the Contingency Reserve.
- Loan guaranty statistics refer to the gross Federal commitment. The cost of an actual default will be less depending on the number of defaults if any, the timing of the default and the amount of recoverable assets.
- The contingency amount for loan guaranties and construction grants provides for construction delays, extraordinary inflation, different plant mixes, increased incentives, etc.
- The price guaranty statistics were calculated assuming that the market price for shale oil rises at 7% per year from a 1976 base of $7 per barrel, and for utility/industrial fuels, the price rises from a base of $9 per barrel. The statistics further assume that no revenues accrue to the government even if market prices exceed the guaranty level.

Synthetic Fuels Commercialization Program Budget

Exhibit 2 - Individual Project Statistics 1/

Plant Type	Size (bbl/d)	Investment 2/	Loan 3/ Guaranty	Construction Grant	Price 4/ Guaranty
Shale Oil	50,000	1000	500	-	450
High-Btu Gas	40,000	870	650	-	-
Utility/Industrial Fuel Regulated	25,000	460	-	230	-
Unregulated	25,000	610	300	-	1800
Biomass	6,000	230	170	-	-

1/ Data are rounded and a detailed cost analysis is available in the Synthetic Fuels Commercialization Task Force Report, Volume III.

2/ The 7% annual inflation rate is included, and the projects are all assumed to start in 1976.

3/ Presumes recommended incentives of 50% loan guaranty for unregulated utility/industrial fuel, and oil shale plants; 75% loan guaranty for biomass and high-Btu gas plants; and price guaranties for shale oil and unregulated utility/industrial fuel.

4/ Contingent costs for price guaranties were estimated assuming that the price of shale oil rises at 7% per year from a 1976 base of $7/bbl and for utility/industrial fuels, the price rises from a base of $9/bbl; and further assuming that no revenues accrue to the government even if market prices exceed the guaranty level.

Synthetic Fuels Commercialization Program Budget

Exhibit 3 - Possible Outlay Schedule for Price Guaranty Payments 1/

($ millions)

	1982	1983	1984	1985	1986	1987	1988	1989	1990	Total Payments Thru 2005
Payments to Unregulated Utility/Industrial Fuel Plants 2/										
$9 Oil Scenario:	50	109	166	233	229	225	220	215	209	3600
$11 Oil Scenario:	34	71	106	144	134	123	111	98	84	1100
Payments to Oil Shale Plants										
$7 Oil Scenario: 3/	167	153	137	120	102	83	63	41	18	900
$9 Oil Scenario:	58	35	12	-	-	-	-	-	-	105
$11 Oil Scenario:	-	-	-	-	-	-	-	-	-	0

1/ Calculations assume 7% per year inflation in capital and variable operating costs; projects start according to the schedule of Exhibit I.

2/ No payments are assumed to accrue to the government even if oil and gas prices exceed the synthetic fuel price guaranty level.

3/ Oil and gas prices are presumed to rise at 7% per year from a 1976 base of $7 per barrel for oil and $1.65 per MMBtu for gas. The $9 and $11 scenario have proportionately higher bases, but same inflation rate.

Synthetic Fuels Commercial Demonstration Program Budget

Exhibit 4: Five-year Budget Projections for 350,000 bbl/day Program

($ in millions)

	FY 1976&TQ	FY 1977 1/	FY 1978 1/	FY 1979 1/	FY 1980 1/	FY 1981 1/
Net Budget Outlays	3	12	26	37	55	91
Administration	3	10	15	15	15	15
Loan Guarantee 2/	0	0	0	0	0	0
Price Guarantee 2/	0	0	0	0	0	0
Grants	0	7	23	42	71	115
Loan Guarantee Fees Collected	(0)	(5)	(12)	(20)	(31)	(39)
New Budget Authority	503	2,610	15	15	15	15
Loan Guarantees	500	1,000	0	0	0	0
Price Guarantees	0	1,000	0	0	0	0
Grants	0	600	0	0	0	0
Administration	3	10	15	15	15	15
New Credit Authority	2,000	8,500	0	0	0	0
Loan Guarantees	2,000	4,000	0	0	0	0
Price Guarantees	0	4,500	0	0	0	0

1/ Funding for FY 1977 and beyond are shown for illustrative purposes as if these programs were funded in ERDA. If, however, EIA is created in FY 1977, the Synthetic Fuels Program would be transferred to it.

2/ No payments for either loan guarantee defaulst or price guaranties are anticipated during this period.

Exhibit 5

Possible Total Cost to Government (FY 76 thru 2005)

350,000 bbl/day Program

($ million)

Financial Incentive	Fiscal Years '76-'81	Fiscal Years 1982 - 2005	Total Cost of Program FY 76 - 2005
Loan Guarantees -Defaults (2 plants)/1	-	$ 1000	$ 1000
- Fee collected by Government (Revenue) (1% annually-debt outstanding) /2	$ (108)	(720)	(828)
Price Guarantees (assumes $11 oil scenario)	-	1,100	1,100
Construction grants	258	242	500
Administrative (assumes $10-$15 million annually)/3	74	240	314
TOTAL COST TO GOVERNMENT/4	$ 224	$ 1862	$ 2086

/1 From Exhibit 1, 12 plants require $6 billion in loan guarantees. If two plants default then, at most, $1 billion would be lost.

/2 See Exhibit 4 for Fiscal Years '76-'81. Calculation for 1982-2005 assumes average annual outstanding debt over the 24 years of $3 billion.

/3 FY 76-81 statistic from Exhibit 4, and FY 1982-2005 assumes $10 million/year for 24 years.

/4 Fees are subtracted from outlays.

TAB H

FACT SHEET

Status of Available Technologies

Introduction:

Technology is available that would allow construction to begin, early in 1977, on plants that could provide significant amounts of the synthetic fuels identified in this report. Operation of these plants would also lead to information that could be the basis for establishing commercial synthetic fuels industries.

Oil Shale Conversion:

The richest U.S. oil shale deposits and center of interest for current commercialization studies are in Utah and Colorado. Oil shale is a fine sedimentary rock rich in insoluble organic material called kerogen. Upon heating to 850 to 900°F, the kerogen is converted directly to liquid hydrocarbon vapors, gas and residual carbon. This heating or retorting is the key step in any propspective commercial oil shale operation. Based on the Bureau of Mines and industry research and development, several technologies recovering oil from shale are now considered ready for scale up to full size equipment. These include:

- Modified in-situ retorting in which low grade shale is mined to create a void in which to do the retorting.
- Underground room and pillar mining with surface retorting.
- Surface mining and retorting.

The surface retorting technologies that are most advanced and therefore of greatest interest to prospective U.S. oil shale operators are:

- The Oil Shale Company solid-to-solid heat transfer retort (TOSCO II).
- The Union Oil Company gas retort (Union Retort B).
- The Development Engineering Incorporated gas retort (Paraho).

Each of these has been tested at the semiworks scale (500-1000 tons/day/retort) providing a basis for commercial scale desings (10,000 tons/day/retort). Other important technologies evolving from Russian and Brazilian oil shale operations are being scaled up in these countries. The Superior Oil Company multimineral approach, now being tested at the pilot plant scale, may be of great importance to recover all mineral values in the mineral rich Piceance Creek Basin shales of Colorado.

Other steps in recovering oil from oil shale are mining, crushing, upgrading the shale oil, and waste disposal. Each have had unique technical, economic and environmental problems, the resolution of which must be confirmed by commercial scale operations.

High-Btu Gas:

High-Btu gas can be made from coal by gasification with steam and oxygen, using the Lurgi Pressure Gasification process, followed by several other processes which result in a gas that is essentially pure methane and has a heating value of about 950-970 Btu/scf.

All of the process steps have been demonstrated on a scale which provides a basis for technical confidence. The gasification process and its combination with the gas conditioning processes are based on forty years of continuous development work, and the experience from 14 commercial plants with a total of 65 gasifiers. Specifically, American coals of the kinds that would be used in the present candidate projects have been evaluated in similar gasifiers located at Westfield, Scotland and at Sasolburg, in South Africa. The tests at Westfield were made between August, 1973, and April, 1974, on Rosebud (Montana), Illinois NO. 5, Illinois No. 6, and Pittsburgh No. 8 coals. The tests at Sasolburg were made in September, 1974, on 10,000 tons of North Dakota lignite.

There has been no commercial-scale methanation of coal gasification product gas, but there is a high degree of technical confidence in this step, based on two pilot plant methanation test programs using gas from coal, and from commercial manufacture of synthetic natural gas (SNG) from naphtha (in which a pure gas containing carbon monoxide and hydrogen is reacted to make methane).

Substitute Fuels for Utility and Industrial Users:

Various fuel forms, and also various technological processes to produce these fuel forms, might be candidates in this category. Among those for which the technology appears to be ready, and for which there also appear to be interested users, are the following categories of candidates:

- Industrial fuel gas: a medium-Btu gas, essentially carbon monoxide and hydrogen, made by gasifying coal with steam and oxygen. Various commercially developed gasifiers are available for this application, including: Lurgi, Koppers-Totzek, Woodall-Duckham, Texaco, Riley-Morgan, Wilputte, Wellman-Galusha, etc. Background on the Lurgi has been discussed earlier; the Koppers-Totzek gasifier has been used widely abroad to make synthesis gas for ammonia manufacture, the

Woodall-Duckham gasifier is in use in Europe for making town gas from coal, the Texaco gasifier gasifies a coal-water slurry and is a development for the widely-used partial oxidation of oil to make gas.

The other gasifiers are smaller capacity units, with substantial experience behind them. The Riley-Morgan gasifier is a `modernized` version of the established Morgan gasifier.

Various industrial gas users and pipeline gas companies have expressed interest in using 300-Btu cu. ft. gas, made by one of the above technologies.

- Fuel methanol: methanol, possibly containing some water and other impurities, which do not interfere with its use as a fuel but may reduce its cost substantially below that for chemical methanol. This fuel is of interest as a clean storable fuel for electric utility peaking applications. It would be made from a synthesis gas ($CO+2H_2$), made by a gasifying coal in a conventional gasifier such as those cited above for making medium-Btu fuel gas. Methanol is traditionally made from a similar synthesis gas made by partial oxidation of natural gas or oil. In any case, the synthesis gas is passed over a catalyst to make the methanol. Until natural gas became cheap and abundant, methanol was made by the coal gasification route. DuPont operated a full-scale plant of this kind in West Virginia until the early 1950`s.

- Solvent refined coal (SRC): is a product made by hydrogenation of coal in a solvent derived from the process itself. The ash contained in the coal behaves as a catalyst for the process. Depending on the amount of hydrogen used, the product can be either a substitute coal (from which the ash and most of the sulfur have been removed) or a clean boiler fuel. The major development activity is underway at Fort Lewis, Washington. Scale-up to commercial capacity depends on developing a superior solid separation system to that presently available. Combustion tests on 3000 tons of the substitute coal, at a power station in Georgia, should be complete in the fall of 1976. Combustion tests of smaller scale are also in progress at the facilities of Babcock and Wilcox of Combustion Engineering.

<u>Biomass Conversion to Gas or Liquid</u>:

Municipal Solid Wastes (MSW) constitutes about 70 percent of the available heat content of all solid wastes, and other significant sources of combustible solid wastes include agricultural (feedlot manure), wood industry, and industrial plant trash. Energy recovery from MSW is an alternative to traditional approaches such as landfills and burning. Among the candidate technical options which result in a liquid or a gas are:

- Pyrolysis of MSW to a fuel gas.
- Pyrolysis of MSW to a fuel oil.
- Anaerobic digestion of MSW to a fuel gas.

All of these approaches are technically feasible, but their rate of acceptance will depend largely on relative efficiency and on economic considerations.

The process for pyrolysis to a fuel gas that appears closest to commercialization is the Purox process of Union Carbide Corporation. This has been demonstrated at the 200 ton/day scale at South Charleston, West Virginia, and is being offered on the market at a module size of about 300 ton/day. It produces a fuel gas with a heat content of about 300 Btu/scf. The reactor consists of three zones: drying, pyrolysis, and combustion of char. Oxygen is injected into the combustion zone at the bottom of the reactor, where it reacts with the carbon char residue from the pyrolysis zone. The specified oxygen-to-refuse ratio is about 0.2 ton of oxygen to 1.0 ton of MSW. The reactor is operated so that the temperature of the slag is about 3000°F.

The process for pyrolysis to a fuel oil that appears closest to commercialization is that of Garrett Research and Development Company. Details of the reactor design are proprietary. The process has been demonstrated at the 4 tons/day scale, and a 200 tons/day demonstration plant has been built in San Diego County.

Anaerobic digestion is a bacterial decomposition process that takes place in the absence of oxygen. Methane and carbon dioxide are produced, in an approximate ratio of 55:45. This technique might be especially useful in exploiting existing landfills. The rate of decomposition of the fill is an important variable in operating such a process. A study by the Los Angeles Department of Water and Power indicates that the methane content in the gas is 50-55% after 2-3 years, but falls to 7-8% after 5-10 years. Processes of this kind appear feasible, but there are, as yet, no large-scale demonstrations.

TAB I

FACT SHEET

Identified Candidate Synthetic Fuel Projects

Identified candidate projects for the proposed program in four synthetic fuel categories are shown in the attached table. For some of these projects the sponsors have already invested considerable capital, acquired sites and leases, made detailed development plans, and tested the chosen technology at a demonstration level. Other projects are still in the formative stage but could commit to construction by January, 1979.

In general, the following is concluded regarding these potential projects:

- $250,000 to $210,000,000 per project have already been invested and committed by industry in commercialization planning and designing activities, for a total identified investment of $800,000,000.
- Government incentives support will be needed to accelerate development schedules since no project has yet committed to construction.
- Assistance may be needed to help individual projects resolve schedule delays caused by legal and regulatory constraints.
- Most projects identified plan to use established technologies rather than "second-generation" types now under development in ERDA.
- The estimated total investment cost of all candidate projects is about $12.5 billion.

Of the eight Shale Oil projects, Rio Blanco, Superior and White River have active programs underway. Development progress appears to have slowed considerably for Colony Development and Federal Shale Lease Tract C-b. Superior Oil stated that their activity will proceed independent of incentives support.

For High BTU Synthetic Natural Gas (SNG) projects, ESCO, ANG, El Paso (Burnham), Panhandle Eastern, and Dunn Center have already completed most of their planning and design activities. Their readiness to commit to construction, however, still requires one or more of the following:

- Full financial commitments
- Applicable government permits
- Environmental impact statements

- Coal and water resource commitments
- Established and acceptable product market prices.

All of these active projects plan to use proven Lurgi technology.

Candidate projects in the Utility/Industrial Fuels category include low/medium BTU gas, and liquid fuels from coal. These projects generally are both smaller in capacity and cost than the shale oil or SNG plants.

Many projects are underway for converting municipal solid waste. Biomass combustion plants were excluded from this category since this application appears to be growing significantly without incentives. Only a few projects were identified which plan to use pyrolysis techniques to produce gas or oil products and can meet the timing criterion for initial commercialization incentives.

Synfuel Product	Project Name	Synfuel Produced	Plant Size	Location	Technology Used	Beginning of Construction/ Beginning of Operation	Funds Expended to Date	Project Cost	Project Status
Shale Oil	Colony Development	Shale Oil	48M B/D	Parachute Creek, Colo.	Underground mining, TOSCO II retorting	1977/1980 (contingent on incentives)	204.1MM	1.1B	Suspended state; P & D of commercial plant completed
	Occidental Petroleum	Shale Oil	40M B/D	Garfield County, Colo.	Modified in-situ retorting	1977/1980 (estimate - firm dates contingent on demonstration)	30MM	400-600MM	In-situ commercial size demo. started December 1975; full commercial expansion contingent on demo. perform.
	Rio Blanco	Shale Oil	50M B/D	Piceance Creek Basin, Colo.	Open pit or underground mining, TOSCO II retorting	1977/1980	5MM	1.0B	DDP to be submitted in March 1976, site development to start in April 1977 contingent on DDP
	Superior Oil	Shale Oil, Minerals	50M B/D	Piceance Ck. Basin, Colo.	Underground mining, prop. retorting proc.	1978/1982	Not available	600MM +	Schedule contingent on land exchange; EIA underway
	TOSCO Sand Wash	Refined Shale Oil	75M B/D •	Uintah Basin, Utah	Underground mining, TOSCO II retorting	1982/1985	1.0MM	1.5B	Planning & feasibility studies; mine exploration
	Tract C-b	Shale Oil	50M B/D	Piceance Ck. Basin, Colo.	Underground mining, TOSCO II retorting	1979/1983	117.8MM (or committed)	923MM	DDP being prepared; site development contingent on DDP
	Union Oil	Shale Oil	50M B/D	Parachute Creek, Colo.	Underground mining, Union "B" retort	1977/1979 (7000 B/D)	Not available	110MM (7000 B/D)	Project construction is pending financing, (7000 B/D first module)
	White River Shale Oil Corp.	Shale Oil	50M B/D	Uintah County, Utah	Underground mining, TOSCO II & Paraho retorting	1976/1980 (10,000 B/D module)	129.7MM (or committed)	600MM-1B	DDP being prepared; site development to start in 1977 contingent on DDP
High BTU Gas	ANG Coal Gasification Co.	SNG	250MM CFD (40M B/D)	Beulah North Dakota	Surface mining, Lurgi gasifier w/methanation	1977/1981	25MM (or committed)	900MM	Construction pending financing and FPC certification
	Dunn Center (Nat. Gas Pipe.)	SNG	250MM CFD (40M B/D)	Dunn County, North Dakota	Surface mining, Lurgi gasifier w/methanation	1978/1982	11MM	1.0B	FPC filing in 1976; construction pending FPC certification
	El Paso (Burnham)	SNG	250MM CFD (40M B/D)	San Juan Cty. New Mexico	Surface mining, Lurgi gasifier w/methanation	1977/1980	12MM (or committed)	1.0B	Construction pending financing and FPC certification; coal lease being renegotiated
	Panhandle Eastern	SNG	250MM CFD (40M B/D)	Converse Cty. Wyoming	Surface mining, Lurgi gasifier w/methanation	1978/1982	10MM	1.0-1.2B	Construction pending final financing plan and FPC certification
	WESCO	SNG	250MM CFD (40M B/D)	San Juan Cty. New Mexico	Surface mining, Lurgi gasifier w/methanation	1976/1980	20.0MM	825MM	Pending FPC certification; preliminary plant engineering completed
Utility/ Industrial Fuels	Columbia Coal Gas. Corp.	300 BTU Gas	21B BTU/D (3750 CBE/D)	Coatesville, Pa.	Koppers-Totzek	Operational 50 months after go-ahead	Not available	114MM	Preliminary study completed
	Consolidated Natural Gas - 3 projects	300 BTU Gas	70B-100B BTU/D (4900-7000 CBE/D)	Cleveland; Ohio River/ West Va.; Pa.	Koppers-Totzek; Babcock & Wilcox; or Texaco Partial Oxidation	1977/1980	250MM	120MM (Cleveland plant)	Exploratory studies

Synfuel Product	Project Name	Synfuel Produced	Plant Size	Location	Technology Used	Beginning of Construction/ Beginning of Operation	Funds Expended to Date	Project Cost	Project Status
Utility/ Industrial Fuels (Cont.)	Consumers Power	300 BTU Gas	188MM CFD (12,000 CBE/D)	Bay City, Michigan	Riley Stoker or Koppers-Totzek	1977/1980	20M	178MM	Preproposal
	LAMPCO	140 BTu Gas	115 MWe (5000 CBE/D)	Baldwin, Louisiana	Texaco Partial Oxidation	1977/1980	Not available	62MM	Economic and engineering reports finalized and documented
	UGI	Methanol	2500 T/D (9500 CBE/D)	Pennsylvania or Ohio	Texaco	1978/1981	500M	300MM	Planning
	Wheelabrator-Frye	Boiler Grade Fuel, Naphtha	46M B/D Boiler Fuel, 4M B/D naphtha	North Central Alabama	SRC Process	1977/1980 (Plant No.1)	28MM	100MM (Plant No. 1)	Feasibility study
Biomass	Baltimore, Md.	Pyrolysis Gas	1000 B/D	Baltimore, Md	Monsanto Landgard	1974/1978	16.0MM (or committed)	Not available	Halt in operation to add additional pollution control equipment
	Minneapolis-St. Paul, Minn.	Pyrolysis Gas & Oil, Char	360 B/D	Minneapolis-St.Paul,Minn.	Union Carbide Purox	1977/1980	Not available	20.0MM	Feasibility study
	New York Metropolitan Area	Pyrolysis Gas	3500 B/D	New York City	Union Carbide Purox		Not available	Not determined yet	Feasibility study
	·Brooklyn Navy Yard ·Fountain Avenue ·Northern Queens					1980/1981 1981/1983 1982/1984			
	San Diego Cal	Pyrolysis Oil	110 B/D	San Diego County, Cal.	Garrett Flash Pyrolysis	1974/1976	9.0MM (or committed)	Not available	Under construction

TAB J

FACT SHEET

Synthetic Fuel Product Prices

Estimates of typical prices for several synthetic fuel types follow. No commercial-scale product fuel plants have been built in the United States and therefore no firm prices for fuel from such plants can be quoted.

In addition to the assumptions shown on each cost sheet, the prices are subject to a variety of assumptions. The most critical are:

- The estimated rate of inflation during the period between January 1, 1976, and the date when construction starts.
- The time period required for construction.
- Plant life is assumed to be 20 years--a minimum estimate.
- Return on investment is calculated as a 15% discounted cash flow (dcf) for the "no incentive" cases and 20% dcf on the equity portion of the "with incentives" cases.
- Capital estimates to build plants and the required returns on capital.

Note, the required selling price for synthetic fuels is particularly sensitive to capital charges. An illustration of this sensitivity for one fuel - shale oil - follows the price illustrations (Exhibit E). A relatively sharp rise in selling price accompanies increases in assumed discounted cash flow rate. Note also that at a 15% discounted cash flow rate, an addition of 25 cents per barrel in capital cost raises the required selling price of the fuel from $14.45 per barrel to $15.98 per barrel.

EXHIBIT A

HIGH BTU (PIPELINE QUALITY) GAS — REGULATED CASE

Product Price Per 1000 SCF in 1-1-76 Dollars

OFFICE OF COMMERCIALIZATION ESTIMATES

	Without Incentives		With Incentives	
	$***	%	$***	%
Total	3.28	100.0	3.28	100.0
Interest	37	11.3	37	11.3
Profit	.22	6.7	.22	6.7
Tax	21	6.4	21	6.4
Feedstock	95	29.0	95	29.0
Operating and Maintenance	1.06	32.3	1.06	32.3
Amortization of Plant	47	14.3	47	14.3

SIZE OF TYPICAL PLANT	250 million SCF per day
INCENTIVE ASSUMPTION	Non-recourse loan guaranty for 75% of project cost
RESOURCE BASE	Western Coal — $9 ton*
FINANCING ASSUMPTION	Debt equity ratio with or without incentive 75/25 Interest 9%
COMPETES WITH	LNG at nominal price of $3.00 per million Btu and naptha conversion at $3.25 to $5.00 per million Btu
TYPICAL INDUSTRY PRODUCT PRICE PRICE ESTIMATES	WESCO — $2.[illegible] Panhandle — 2.90 El Paso Natural Gas — 3.17*** American Natural Gas — 3.13***
REGULATION	Product price and method of pricing subject to FPC regulation and to regulation by State PUC if intrastate

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* A $1 per ton change in coal price will change the OCOM estimates of both the regulated and nonregulated product feedstock cost and total product price by $.11 per M SCF.

** Initial rate to be permitted by FPC per order of 11/21/75. Order recognizes that this price will not provide full recoupment of costs, and provides for adjustments.

*** Assumes a charge levied on present customers to pay for financing costs during period of construction.

EXHIBIT B

SHALE OIL — UNREGULATED CASE

Product Price Per Barrel in 1-1-76 Dollars

OFFICE OF COMMERCIALIZATION ESTIMATES

FULL-SCALE PLANT

Without Incentives			With Incentives	
$	%		$	%
14.45	*100.0*	Total	13.31	*100.0*
		Interest	1.51	*11.3*
4.57	*31.6*	Profit	3.08	*23.1*
4.05	*28.0*	Tax	2.89	*21.7*
.68	*4.7*	Feedstock	.68	*5.1*
3.50	*24.2*	Operating and Maintenance	3.50	*26.3*
1.65	*11.4*	Plant	1.65	*12.4*

SIZE OF TYPICAL PLANT:	Full-scale — 50,000 bpd Single train — 8000 bpd
INCENTIVE ASSUMPTION:	Full-scale — mortgage loan* guaranty Single train — construction loan* guaranty
RESOURCE BASE:	Oil shale
FINANCING ASSUMPTION:	Debt equity ratio with incentive — 50/50 without incentive - 0/100 Interest — 9%
COMPETES WITH:	Crude oil — but upgraded shale oil will be a superior product
TYPICAL INDUSTRY PRODUCT PRICE ESTIMATES — ALL EQUITY ON BASIS COMPARABLE TO OCOM $14.45:	Union — $13.75/$15.50** TOSCO — $18.90

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* Non-recourse loan guarantee for 50% of project cost plus product price support.

** Assumes no inflation, no delays. $13.75/bbl for single train product; $15.50 for full-scale. Single train product is not upgraded, full-scale product is.

EXHIBIT C

MEDIUM BTU GAS (AS PROXY FOR SUBSTITUTE FUELS GENERALLY) — REGULATED CASE

Product Price Per 1,000,000 BTU's

OFFICE OF COMMERCIALIZATION ESTIMATES

	Without Incentives $	Without Incentives %	With incentives $	With incentives %
Total	2.64	100.0	2 26	100 0
Interest	24	9 1	.12	5 3
Profit	.13	4 9	07	3.1
Tax	12	4 6	07	3 1
Feedstock	.83	31 4	83	36 7
Operating and Maintenance	1 02	38 6	1 02	45 1
Plant	30	11 4	15	6 6

SIZE OF TYPICAL PLANT	25 000 Cbe/day 290 MM SCF cubic feet/day at 500 Btu/cubic foot)
INCENTIVE ASSUMPTION	Grant for 50% of project cost
RESOURCE BASE	Illinois Coal — $9/ton*
FINANCING ASSUMPTION	With incentive 50% Grant 37 ½% Debt 12 ½% Equity Without incentive 75% Debt 25% Equity Interest — 9%
COMPETES WITH	LNG at nominal price of $3.00 per million Btu and naptha conversion at $2.25 to $5.00 per million Btu
TYPICAL INDUSTRY PRODUCT PRICE ESTIMATES	CNG — $3.08
REGULATION	Subject to state regulation; if used for generating electric power for sale may also be subject to FPC jurisdiction

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* A $1 per ton change in coal price will change the OCOM estimates of both the regulated and unregulated product feedstock cost and total product price by $.09 per MM btu.

EXHIBIT D

MEDIUM BTU GAS (AS PROXY FOR SUBSTITUTE FUELS GENERALLY) — UNREGULATED CASE

Product Price Per 1,000,000 BTU's

OFFICE OF COMMERCIALIZATION ESTIMATES

Without Incentives $	Without Incentives %		With Incentives $	With Incentives %
4.23	100.0	Total	3.96	100.0
		Interest	.26	6.6
1.05	24.8	Profit	.78	19.7
1.00	23.6	Tax	.74	18.7
.83	19.6	Feedstock	.83	21.0
1.01	23.9	Operating And Maintenance	1.01	25.5
.34	8.0	Plant	.34	8.6

SIZE OF TYPICAL PLANT:	25,000 Cbe/day (290 MM SCF cubic feet/day at 500 Btu/cubic foot)
INCENTIVE ASSUMPTION:	Non-recourse loan guaranty for 50% of project cost plus product price support
RESOURCE BASE	Illinois Coal $9/ton*
FINANCING ASSUMPTION	Debt equity ratio with incentive — 50/50 without incentive - 0/100 Interest — 9%
COMPETES WITH:	LNG at nominal price of $3.00 per million Btu and naptha conversion at $3.25 to $5.00 per million Btu
TYPICAL INDUSTRY PRODUCT PRICE ESTIMATES:	Non-available — see regulated case

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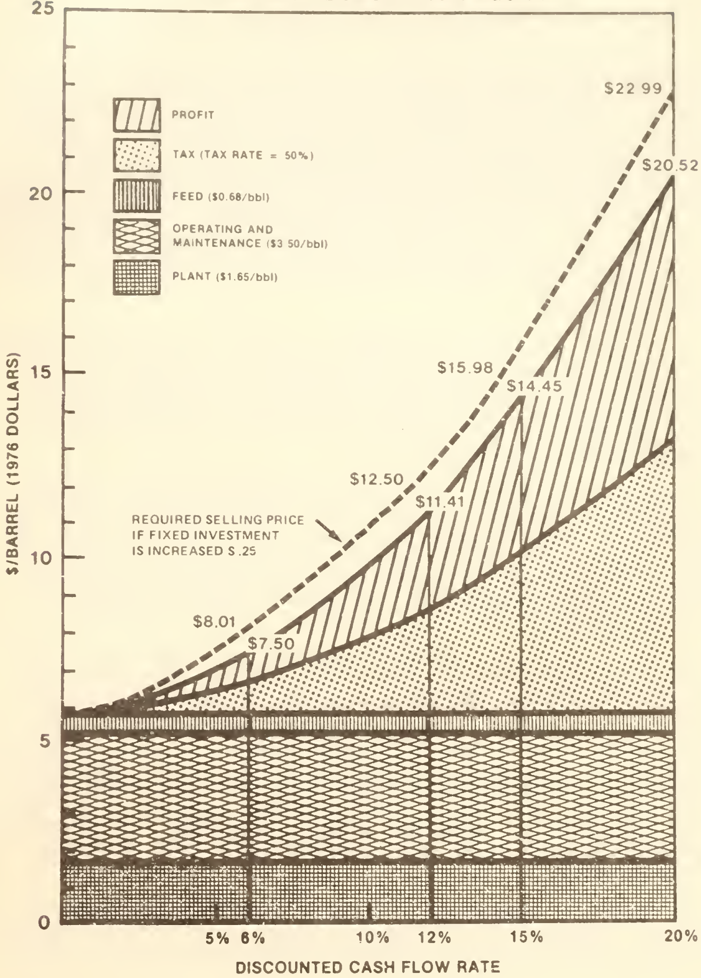
* A $1 per ton change in coal price will change the OCOM estimates of both the regulated and unregulated product feedstock cost, and total product price by $.09 per MM Btu.

EXHIBIT E
REQUIRED SHALE OIL SELLING PRICE AS FUNCTION OF DISCOUNTED CASH FLOW
NO INCENTIVE CASE – 100% EQUITY



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TAB K

FACT SHEET

Patents and Technology

In conducting the proposed synthetic fuels program, it will be necessary to balance the interests of the United States with the need to provide an incentive to firms which have made substantial investments in developing technologies which might be commercially demonstrated under the Program. In balancing these interests, it is necessary to consider the patents and technology existing prior to, and relied upon during the demonstration as well as the improvements made during the construction and initial start-up of the facility. In this regard, it is expected that most of the technologies that will be commercially demonstrated by this program already exist and are patented. Thus, no completely new developments are likely, although there may be refinements in the form of improvements to already patented technologies.

As to preexisting patents and technology, a factor that will be considered in awarding each guaranty will be the availability of such patents and technology to other parties desiring to construct and operate plants utilizing the processes demonstrated. Provisions will be considered for each guaranty which are directed to the availability and licensing of background patents and technology.

Technology developed during the course of the demonstration is generally to be considered a project asset and, in the case of default, would be treated similar to all other project assets. Of course the default provisions of the guaranty will include a requirement that in the event of a default the applicable technology and patent rights are to be made available to the government or its designee if needed to complete and operate the facility.

ERDA has interpreted Sec. 9 of the Federal Nonnuclear R&D Act of 1974, which requires ERDA to obtain title to the inventions made under its contracts, as not being applicable to loan guaranties, because guaranties provide only limited financial assistance, rather than outright Federal support of all or most of the cost project. It is not generally the practice for the Federal Government to acquire title to incremental improvements to existing patented technologies where such limited assistance is provided. For example, other government agencies, (e.g., HUD, Maritime Administration, Department of Agriculture, SBA) that administer loan guaranty programs do not acquire patent rights under agreements they have executed.

Outright Government acquisition of title to inventions under guaranties could have a negative impact on the willingness of certain companies to participate in this program. However, the legislative proposal reported by the House-Senate conference last year specifically required that the title and waiver of title provisions of Sec. 9 apply to loan guaranties. In any event, whether or not Sec. 9 applies, the guaranty provisions included in subsequent regulations would protect the public's interest in the availability of inventions. If Sec. 9 applied and waivers of patent rights were granted, the Government would reserve the right to require the waiver recipient to license on reasonable terms to other parties desiring to construct and operate such plants to ensure that the technology is available for rapid commercialization. If Sec. 9 is inapplicable, the background rights provisions generally considered by ERDA would include these inventions and their availability for use by others. An example of such a background provision is found in the ERDA proposed Geothermal Loan Guaranty Regulations, 10 CFR 790.44, 40 Fed. Reg. 50100-50107, October 28, 1975.

TAB L

FACT SHEET

Capital Market Impact of Program

The precise impact of the Synthetic Fuels Commercial Demonstration Program on capital markets depends on the general availability of investment capital and the demand for funds by the program in any specific time period. However, in general, investments projected to total $8.4 billion for the period 1977-1986 and $9.5 billion over the full term of the 350,000 bbl/day Synthetic Fuels Commercial Demonstration Program are not expected to materially affect conditions in the U.S. capital market for the following reasons:

- The most recent forecasts of the capital market do not envision a general capital shortage for the energy industry through 1985.
- The maximum investment in synthetic fuel plants projected for a single year (1981) totals $1.6 billion (Exhibit 1).
- The peak of net projected Federal budget outlays in connection with the program equals only $195 million in 1985 (Exhibit 1).
- Program investment in 1981 equals only 2.3 percent of the total investment projected for all energy industries and 0.4 percent of total business fixed investment (Exhibit 2).
- Savings (funds) induced by the program will be recycled to the capital market.
- The impact of the program on short-term interest rates during the peak year of investment (1981) is estimated to be insignificant--ranging from 0.005 to 0.05 percent.

Capital Shortage or Adequacy

In recent years a number of studies[1/] have suggested that the energy industries may face a capital shortage in the near future. If realized, the proposed synthetic fuels program would of course be affected by such a shortage. On the other hand, studies by the Brookings Institution, the Department of Labor, Data Resources, Inc. and most recently the Bankers Trust Company found that a general shortage of capital through 1985 can be avoided provided appropriate economic policies are adopted.[2/] In this regard, the study prepared by the Energy Group of Bankers Trust Company concludes that capital markets can adequately meet the needs of the energy industries even if the accelerated investment targets embodied in U.S. energy independence goals are adopted.

Investment Requirements

The combination of financial incentives (i.e., loan guarantees, price guaranties and construction grants) that are proposed for the 350,000 bbl/day synthetic fuels program would result in plant investment totalling about $7.4 billion between 1977 and 1986. Exhibit 1 presents the annual private sector outlays for capital investment in synthetic fuels commercial demonstration plants along with the time phasing of plant construction and production. In addition, Exhibit 1 details the anticipated annual net Federal Government budget outlays between 1977 and 1986. Adding these costs to private sector capital requirements the total investment requirements for the program equals $8.4 billion for the period 1977 - 1986 and $9.5 billion through the year 2005 (see Tab G for more detailed estimates of the cost of the Government). The peak year for the combined private sector and Federal investment is 1981 when approximately $1.6 billion is expected to be expended.

Induced Savings

Although the Synthetic Fuels Commercial Demonstration Program entails a demand for investment capital, savings induced by the program will in turn recycle funds to the capital market. To what extent such savings represent new savings (savings not otherwise forthcoming) cannot be determined since it is not known what investments may be foregone as a result of the program. The amount of ordinary savings generated by the program for capital market use depends on the impact of the program on Gross National Product and the savings rate applicable at the time of impact. The effect of the program on GNP over a specific period will be determined by the level of employment in the economy during that period and the amount of investment, operation and maintenance costs, efficiency improvement and import substitution arising from the synthetic fuels program. Initial estimates indicate gross savings in current dollars induced by the 350,000 bbl/day synthetic fuels program would range from 45 to 90 percent of total program investment ($8.4 billion) for the period 1977 - 1986.

Interest Rates

The effect on interest rates from the program can be inferred from the size of capital investment in synthetic fuels commercial demonstration plants relative to total energy investment requirements and total business fixed investment. These data are presented graphically in Exhibit 2. Comparison of the data reveals that total investment in synthetic fuel plants is very small relative to the totals for all energy industries and business fixed investment. The relative effect on capital markets of the projected investment in synthetic fuels commercial demonstration plants would therefore be minimal. Thus, the range of interest rates prevailing in the U.S. capital markets at the time investment capital is needed for the commercial demonstration plants will be minimally affected by the demand for funds to invest in such plants.

In order to quantify the impact on interest rates, two econometric models were utilized.[3] The results of the Data Resources Incorporated analysis indicate that under normal conditions interest rates would be affected by about 2 "basis points", i.e., a .02 percent increase in interest rates (e.g., during 1981 interest rates move from 8 percent to 8.02 percent). However, if the capital market is "tight" as forecast by the New York Stock Exchange and Chase Econometric Associates, the impact on interest rates would equal about 5 "basis points" (interest rates would move from 8 percent to 8.05 percent). On the basis of the Federal Reserve Board model the impact of the program on interest rates is estimated to range in the thousandths of a percent (e.g., interest rates increase from 8 percent to 8.005 percent). These results were to be expected considering the fact that the proposed $1.6 million peak year investment for the synthetic fuels program represents 0.6 percent of the privately held Federal debt in 1975 and 0.2 percent of corporate debt.

1/ The two most pessimistic studies were published by the New York Stock Exchange and the Chase Econometric Associates, Inc.: The Capital Needs and Savings Potential of the U.S. Economy; Projections Through 1985 (The New York Stock Exchange, September 1974); Michael K. Evans, Long-Term Forecast: The Next Ten Years, Inflation, Recession, and Capital Shortage (Chase Econometric Associates, Inc., August 1975).

2/ Barry Bosworth, James S. Duesenberry, and Andrew S. Carron, Capital Needs in the Seventies (Brookings Institution, 1975). Special Study Group, Unpublished materials partially based on The Structure of the U.S. Economy in 1980 and 1985, BLS Bulletin 1831 (U.S. Department of Labor, 1975). Allen Sinai and Roger E. Brinner, The Capital Shortage: Near Term Outlook and Long-Term Prospects, Economic Studies Series #8 (Data Resources, Inc., 1975). The Energy Group, Capital Resources for Energy Through the Year 1990 (Bankers Trust Company, 1976).

3/ Data Resources Incorporated (DRI) Econometric Model for the United States and the Federal Reserve Board (FRB) Quarterly Econometric Model. More detailed information about the methodology and results can be obtained from Allen Sinai (DRI) and Galen Burghard (FRB).

CAPITAL MARKET IMPACT OF SYNTHETIC FUELS PROGRAM

Exhibit 1 - Investment Requirements, Construction, and Production Schedule -- Information Option (350,000 bbl/day) 1/

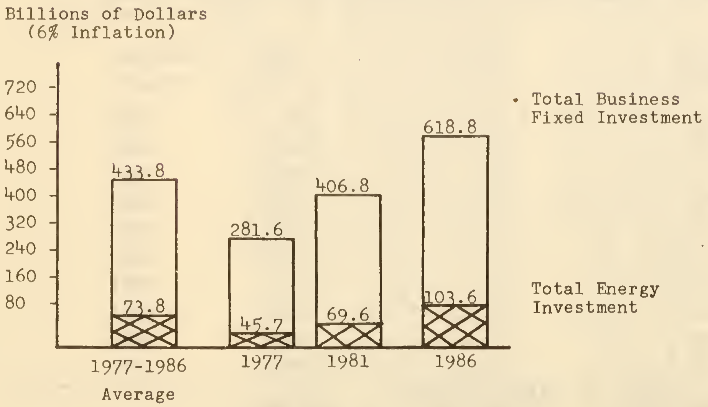
Year	Private Sector Capital	Net Budget Outlay 2/	Total Investment Requirements	Plants in Construction	Plants in Production	Cumulative Prod. Capacity
		($ millions)		(Number)	(Number)	(1,000 bbl/day)
1977	380	12	392	9	0	0
1978	620	26	646	11	0	0
1979	1050	37	1087	14	0	0
1980	1235	55	1290	11	3	18
1981	1520	91	1611	10	4	24
1982	1235	144	1379	9	5	30
1983	855	131	986	3	11	260
1984	380	165	545	2	12	300
1985	95	195	290	0	14	350
1986	50	144	194	0	14	350
1977-86	7420	1000	8420			
1977-2005	7420	2080	9500			

1/ Based on Exhibit 1 of Fact Sheet for Program Budget Estimates (Tab G) and the Synthetic Fuels Commercialization Task Force Report, Volume III, page D-39.

2/ Anticipated Federal expenditures minus loan guarantee fees; $11 oil scenario.

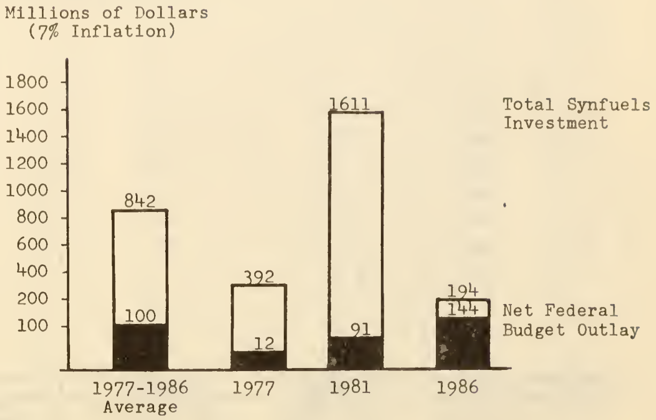
CAPITAL MARKET IMPACT OF SYNTHETIC FUELS PROGRAM

Exhibit 2 - Investment Requirements For The 350,000 bbl/day Synthetic Fuels Program In Relation To Total Energy And Business Investments



Source: Bankers Trust Company - 1974 prices. Their data was adjusted by the historic (1966-1975) implicit price deflator for gross private fixed investment.

Figure 1 - Share of Capital Investment by Business Going to the Energy Industry.



Source: Exhibit 1.

Figure 2 - Investment Requirements for the Synthetic Fuels Commercial Demonstration Program.

TAB M

FACT SHEET

Environmental Impact

As part of the analysis leading to the recommended 350,000 bbl/day first phase Synthetic Fuels program, an extensive environmental analysis was completed. The analysis included formulation of an explicit environmental protection strategy and preparation of a draft programmatic Environmental Impact Statement (EIS).

The major conclusions of the Synthetic Fuels environmental analysis are:

- Numerous environmental uncertainties exist concerning effluents, pollutant mechanisms and impacts. The severity and types of impacts depend on choice of process and location of plant.

- However, environmental impacts at 350,000 bbl/day level can be minimized through use of existing control technology and programs.

- Considering the information to be gained from the 350,000 bbl/day program, the program is regarded as environmentally advantageous.

In addition to preparation of both programmatic and site-specific environmental impact statements as required by the National Environmental Policy Act, the Synthetic Fuels program would be conducted utilizing a strict methodical environmental protection strategy incorporating the following five major elements:

- Use of environmental protection criteria in evaluation of project proposals. Candidates will be systematically compared with regard to probable primary and secondary environmental impacts, including both direct plant residuals and forecasted secondary and cumulative effects.

- Federal approval and State review of detailed site development plans, as well as off-site project-related plans.

- Extensive coordinated efforts to develop an environmental data base that will benefit the EPA-coordinated Interagency Energy/Environment R&D Program. In particular, the following two Interagency Program objectives will be supported by the environmental data base:

  - -- determination of potential environmental impacts of synthetic fuel processing operations of commercial scale.

  - -- develop control technology to minimize negative impacts and diseconomies associated with retrofitting.

- Comprehensive environmental monitoring of plants, including ambient air quality, water quality at key well and stream locations on- and off-site, noise levels, continuing investigations into revegetation dynamics and other ecological aspects, and survey of land use changes.

- Environmental advisory committee with state and other representation to ensure regional and state participation in decision process.

Finally, it is intended that the Synthetic Fuels program be carried out in such a manner as to meet or exceed all applicable Federal and State environmental laws and regulations.

TAB N

FACT SHEET

Water Resources

Water resources considerations for the Synthetic Fuels Commercialization Program focus primarily on water consumption and availability where required. Water supplies in all the potentially affected basins are believed to be sufficient to support the complete 350,000 bbl/day Program, along with anticipated non-energy and in-stream uses.

Water Consumption:

Each kind of plant that could be included in the commercial demonstration program consumes water--both within plant processes and through evaporative losses from cooling systems. Water consumption rates for various standard size synthetic fuel plants are compared with consumption rates associated with other major energy facilities in Chart I.*

In addition to these direct operating water uses, other water requirements assocated with any major coal energy plant--either synthetic fuels or conventional power--would include:

- Mine and plant construction: relatively small water amounts for dust control and sanitation.
- Mined area reclamation: major water consumption for revegetation and/or irrigation.
- Spent shale deposition: major water usage for reclamation purposes.
- Municipal demand increases: about 2-3.6 million gallons per day per standard size plant (from CEQ, Sixth Annual Report, Table 30).

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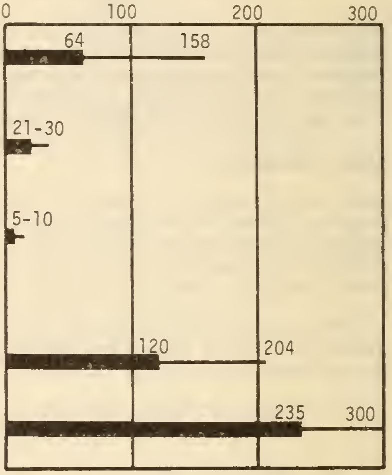
*Sources: Radian Corporation, Western Regional Energy Development Study, August 1975, Table B-6.
USGS, Circular 703, 1974, Page 8.
FEA, Project Independence Blueprint Water Report, November 1974, Table (from WRC and USGS data).
CEQ, Sixth Annual Report, Table 28.

-2-

WATER CONSUMED
(million of gallons per day)

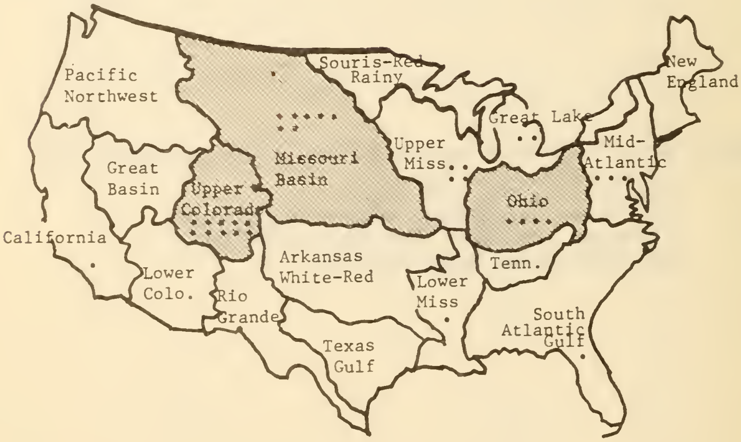
Standard Size Units	... per Standard Size Unit
High Btu coal gasification--40,000 bbl/day equivalent	5.8
Oil shale conversion 50,000 bbl/day	7.3
Substitute fuels 25,000 bbl/day equivalent	1.6
Others for Comparison	
Coal-fired power plant--1000 mw	7.9 - 13.4
Nuclear--1000 mw boiling water reactor	15.4 - 19.6

...per Quadrillion Btu Produced Daily (low and high estimates)



Water Availability:

All identified candidate synthetic fuel projects are located on the map below with respect to the eighteen river basins in the continental United States:



The significant water-using candidates for commercial development are situated mainly in the three shaded basins--the Missouri, Upper Colorado, and Ohio River Basins. Gross water availability within these basins is estimated as follows:

OVERALL WATER AVAILABILITY
IN RIVER BASINS POTENTIALLY MOST AFFECTED
(millions of gallons per day)

	Missouri River Basin	Upper Colorado River Basin	Ohio River Basin
(A) Projected 1985 non-Energy Water Demand	13,600	4,200	1,500
(B) Estimated 1970 Supply*	39,100	5,700	14,800
(C) Available Water Supplies for Energy and In-stream Uses: (B) - (A)	25,500	1,500	13,300
(D) Estimated Water required for 350,000 bbl/day Program**	13	21	5
(E) Percent of Total Supply: 100 x (D)/(C)	0.05%	1.4%	0.04%

Source: FEA, Project Independence Blueprint Water Report, November 1974, Table 11 (from WRC and USGS data).

*Includes natural regulated and unregulated fresh water supplies and groundwater.

**Assumed oil shale plant sites: 1 each in Utah and Colorado. Assumed high-Btu gasification sites: 1 each in four corners area, Wyoming, and North Dakota. Assumed low-Btu gasification sites: 3 in Ohio River Basin, 1 elsewhere. Assumed biomass conversion sites in other basins.

Other factors influence the availability of water for synthetic fuel projects in these basins, including Indian and other legal rights, concurrent municipal and industrial development, and the progress of water resource developments.

Summary:

From the foregoing, water demanded by the complete 350,000 bbl/day commercial demonstration program is a small portion of available water supplies in all potentially effected basins, accounting generally for less than 1%. Irrigation, municipal, and industrial consumption will continue to demand the majority of available supplies. Finally, it is noted that most of the major water-using candidate synthetic fuel plants have already made needed arrangements for obtaining water rights at their planned sites.

TAB O

FACT SHEET

Socio-Economic Impact Assistance for Synthetic Fuels Commercial Demonstration Program

State and Local Concerns:

Factors which inhibit the ability to raise and invest public capital on a lead time basis give rise to state and local governments' concerns about the secondary impacts of synthetic fuels development. The ability to raise front-end money is a primary factor in preventing or mitigating the adverse social impacts of rapid growth and "boom towns."

These factors include revenue lags, local statutory constraints, inability to market bonds due to the substantial risks involved with synthetic fuels, exposure to risk after bonding due to possible plant delay or failure, and, in the case of Indian tribes, lack of access to traditional sources of revenue and credit.

Need for Federal Aid:

Front-End Money. State and local governments may not be able to raise sufficient front-end capital for planning and development of infrastructure through issuance of bonds because of the uncertainty associated with a plant's ultimate success, particularly if plants are built in remote, undeveloped areas.

Continued Ability to Amortize Debt. After front-end capital is raised and invested in infrastructure, a delay in plant construction or premature shut-down would jeopardize a community's ability to service its debt from plant-generated revenues and could put the community into default.

Estimated Total Costs of Public Infrastructure:

The expected cost of Federally assisted additional public infrastructure development necessitated by the 350,000 bbl/day program is estimated to be in the neighborhood of $425MM over the next 5-10 years. (See Table 1 for derivation of cost estimate.) It is expected that normal and customary State and local taxation will, over twenty years, be more than enough to pay such costs including interest. The problem is how to make sure that happens.

Possible Solutions to Problem:

Analysis was made of several options including use of existing Federal programs; a new grant program; industry financing; and ERDA guarantee of debt service derived from expected tax payments from projects.

The Recommended Solution:

Eligibility:

- A government jurisdiction or Indian Tribe is eligible if a major increase in its total population will occur as a direct result of a synthetic fuels commercial demonstration plant and additional public facilities are required.

- In general, there are three types of areas that will be impacted by synthetic fuel plants.

  (1) A well developed area with significant existing population and supporting facilities; the influx of population caused by the synthetic fuels plant would be small in comparison to existing population.

  (2) Areas with some existing population and supporting facilities; the influx of population caused by the synthetic fuels plant would be a major increase to the existing population.

  (3) Areas with little or virtually no population and supporting facilities; the influx of population caused by the synthetic fuels plant would be an explosive increase.

- In general, undeveloped and partially developed areas and areas of which they are a subdivision would be eligible. Well developed areas and areas of which they are a subdivision would generally not be eligible.

- The ERDA Administrator will promulgate regulations on eligibility consistent with the preceding requirement and after consultation with affected State/local governments. The ERDA Administrator will make final determinations on eligibility. No project application would be approved by ERDA unless adequate State/local planning has occurred and adequate provision has been made for financing and any necessary revenue sharing agreements between jurisdictions. It is expected that the ERDA Administrator will make planning grants available for such planning.

Estimation of Community Facility Needs:

Based on Nation-wide average costs:

- The cost of eligible public infrastructure needed is expected to be $5,500 per capita.

- In remote, undeveloped locations an additional $1,500 per capita may be needed.

- An estimate of total capital necessary for public infrastructure is determined by multiplying the per capita cost by the total plant employment and associated population increase (See Table 1 and accompanying footnotes). In addition, this amount will be adjusted for:

  ---increases due to inflation during the construction period (the per capita amounts of $5,500 and $1,500 are based on 1976 costs);

  ---public infrastructure existing in the area prior to plant construction;

  ---density of population existing prior to plant construction.

Types of Assistance:

The ERDA Administrator will determine which form of assistance is appropriate in each case. Possible forms of assistance include:

Direct loans

Loan guaranties

Guaranty of an annual tax revenue stream

Requiring applicant to prepay taxes

Requiring applicant to bear infrastructure costs

Planning grants

Scope of Assistance:

Depending on local community needs, there will be some restriction on the types of facilities eligible for inclusion in this program. It is not anticipated that assistance will be provided for operating expenses.

The program should:

- make assistance available only where needed,
- make assistance available when needed (at front-end),
- limit assistance to appropriate purposes and in appropriate amounts,
- be relatively easy to administer,

- rely on State and local community participation in decision-making and development of the necessary facilities,
- enhance rather than replace State and local access to capital markets, and
- encourage pass-through of costs to the end user.

Form of Securities:

- Guaranty will be provided if:

  --Interest on bonds will be subject to Federal Income Tax.

  --Municipality(s) agree to earmark sufficient direct tax revenues received from plant (property and other) to amortize debt.

  --Term of debt is limited to two-thirds of the useful plant life, to be fully amortized by equal annual installments.

  --Debt is issued within five years from the start of construction by the plant developer.

- Debt instrument may be called for redemption by guarantor.
- Administrator is authorized to pay interest differential between tax exempt and taxable debt as determined by Secretary of Treasury.

Administration:

- ERDA will administer the assistance program, subject to Treasury concurrence in specified areas.
- ERDA will negotiate directly with the appropriate jurisdiction, generally the affected municipalities on the terms and agreements.
- ERDA will consult with State and local governments, communities and Indian Tribes.

Cost of the Program:

The total of public infrastructure for the 350,000 barrel per day program is estimated to be about $465MM. Allowing $5MM for planning grants for the synthetic fuels plants assumed to be built in partially developed or remote areas, and deducting $45MM for non-Federally assisted facilities, the total estimated cost of Federally assisted public infrastructure for this level of program would be $425 MM.

The current estimated cost of public infrastructure is greater than the $350MM reported previously. The reasons for the increase are:

- Higher cost estimates on certain facilities based on re-evaluation of previous analysis.
- The amount of support for eligible community development projects is increased from a maximum of 75% to a maximum of 100%.
- The new estimates are based on 1976 costs whereas the $350MM estimate was based on 1974 costs.

TABLE 1

POPULATION IMPACTS AND INFRASTRUCTURE COSTS 1/

Type Plant	During Peak Construction		During Operation & Mining		**Additional Costs if New Towns Needed (000)	Total Costs (000)
	Population	Costs (000)	Population	**Additional Costs (000)		
Shale 2 Western in remote areas	21,952	$81,000	21,354	$39,000	$32,000	$152,000
Hight BTU 2 Western in remote areas in 1 Eastern (surface mine) in partially developed area	53,760	$199,000	23,720	$43,000	$22,000	$264,000
Low BTU 1 Western & 1 Eastern (underground mine) in partially developed areas & 2 Eastern (surface mine) in well developed areas	4,480	$17,000	8,795.	$32,000	--	$48,000
TOTAL		$297,000		$113,000	$54,000	$465,000 2/

1/ See following background material on per capita community costs, additional community expenses because of varying population, new town supplemental expenses, etc.

2/ Exclude $45MM for non-federally assisted projects to be determined at time of local planning analysis and include $5MM for ERDA planning grants.

Per Capita Costs of Community Facilities 1/

(4th Quarter, 1975)

A. Permanent Population.

1. Water	
Pipeline	$ 525
Source Development	58
	$ 583
2. Sewage and Storm Drainage	
Sewer Pipeline	$ 181
Dumping Station & Treatment Plant	93
Drainage Pipeline	329
	$ 603
3. Solid Waste	$ 10
4. Fire	$ 25
5. Police	$ 46
6. Recreation	
Parks & Playgrounds	$ 102
Open Space Development	16
	$ 118
7. Libraries	$ 45
8. Health	$ 241
9. Education	
Elementary	$ 1,130
Secondary	548
	$ 1,678
10. Streets and Roads	$ 1,144
11. Government Administration	$ 22
12. Land Acquisition	$ 377 2/
TOTAL, 4th Quarter, 1975	$ 4,892 3/
ESTIMATED 1976 TOTAL	$ 5,500

B. Construction population.

Assumes cost of $3,700 per capita. (Based on analysis done for Wyoming Select Committee which estimates 2/3 of total infrastructure would be in place during this phase.)

C. New town supplement.

Assumes cost of $1,500 per capita. (Based on analysis done for Wyoming Select Committee which estimates infrastructure costs 1/3 more if built in new town than added to existing town.

**Additional Costs are calculated as follows:

A. $1,800 additional per capita for permanent population if permanent population is less than or equal to construction population. Assumes total cost of infrastructure for permanent population is $5,500 per capita and that infrastructure built at $3,700 per capita for construction population is entirely available for permanent population.

B. $5,500 additional per capita for permanent population in excess of construction population.

C. $1,500 additional per capita for permanent population if new town is involved.

Footnotes:

1/ All cost estimates are taken from The Costs of Sprawl, prepared for CEQ, HUD, and EPA by Real Estate Research Corporation (April, 1974) and have been inflated to fourth quarter 1975 dollars using indices provided by the Government Division of the Bureau of Economic Analysis, Department of Commerce.

Costs are based on a community size of 33,000. No economies or diseconomies of scale have been taken into account. It is assumed that the community has a mix of housing types and that the development has been planned.

Costs include allowances for vehicles and equipment.

Costs are based on national averages and reflect present technologies, construction practices and service standards.

Assumptions about capacity and use are in The Costs of Sprawl: Detailed Cost Analysis pp. 90-130.

2/ 32 acres per 1,000 population at $9,000 per acre, from The Costs of Sprawl, pp. 92 and 194.

3/ Costs for Alaska are estimated to be about 45% higher or $7,250 per capita.

TAB P

FACT SHEET

State and Local Participation

It is the Administration's intent in planning and in executing the synthetic fuels program to involve fully state and local governments which are likely to be affected by synthetic fuels projects. In particular, a Synfuels Environmental Advisory Board (SEAB) will be established to provide an effective mechanism for ensuring that State and local governments and the public will have a continuing voice in the Synthetic Fuels Commercialization Program. SEAB will advise ERDA officials regarding the overall strategy and implementation of programs for environmental protection, including socio-economic concerns. In particular, SEAB will provide continuing consultation on meeting the main objectives of the environmental protection strategy:

- to ensure that synfuels projects selected are environmentally sound in design, construction, and operation;
- to mitigate or prevent any significant adverse impacts that may otherwise result from a project included in the program; and,
- to develop a complete environmental knowledge base for subsequent decisions concerning synfuels commercialization.

SEAB will advise ERDA with respect to environmental and socio-economic matters concerning the Synthetic Fuels Commercialization Program. The membership of the SEAB would include representatives nominated by Governors, the National Academies of Science and Engineering and ERDA.

As implementation of the program begins, ERDA would publish solicitations for specific synfuels projects only after the Programmatic EIS is completed and the final decision has been made to actually implement the program. A separate solicitation would be issued for each different type of project. Industry would respond with detailed project proposals developed in coordination with State and local governments. Before construction begins on any individual project, site-specific development plans and EIS's would need to be prepared, publically reviewed, and approved. Also, the proposed Environmental Protection Strategy provides substantial opportunities for State and local inputs into the process of selecting individual projects and ensuring environmentally sound construction and plant operations.

TAB Q

FACT SHEET

Program Implementation

The President has decided to proceed with implementation of the 350,000 bbl/day commercial demonstration program involving 12-17 plants. The overall life of the program may extend for 25-30 years depending on the actual operating life of the plants that are included.

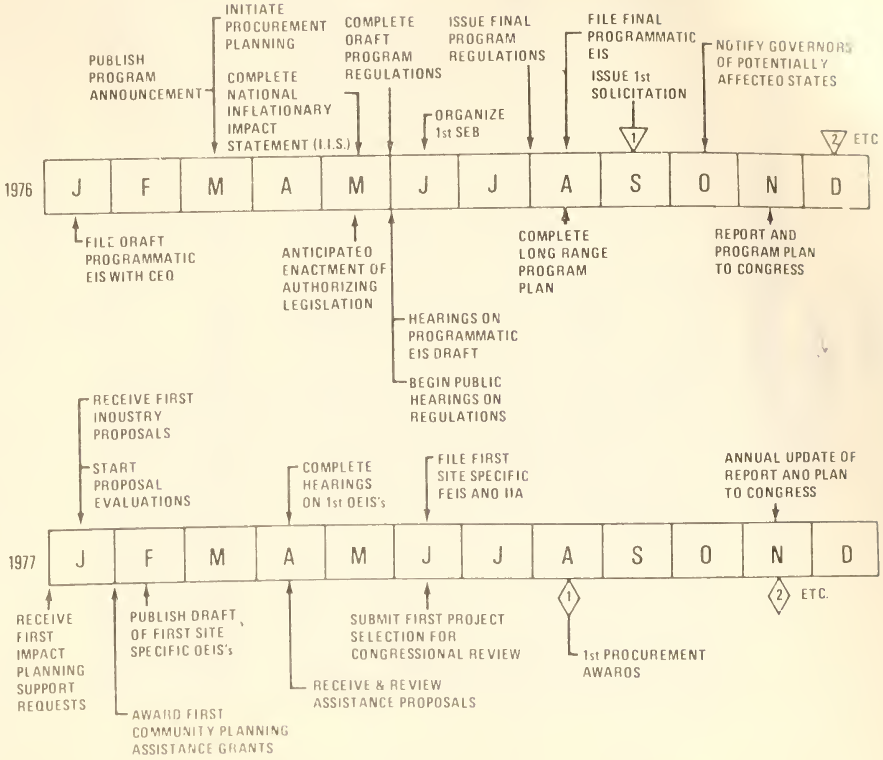
The more significant next steps in implementation include:

- completion of necessary analyses, announcements, etc., necessary to proceed with the program
- Congress providing funding authorizations for the program
- issuance of solicitation for specific project proposals
- evaluation and selection of proposals.

Exhibit A outlines the individual items to be completed and the relative time frames for completion of this phase.

Once final decisions are made and plant selections determined, actual construction of the plants could proceed if regulatory clearances are obtained. The construction period may be as little as three years for a biomass conversion plant to as long as 6-7 years for an oil shale or high BTU gasification plant. Thereafter the plants would become operational and may operate up to 20-30 years.

INTEGRATED SCHEDULE OF MAJOR EVENTS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PUBLISH PROGRAM ANNOUNCEMENT
INITIATE PROCUREMENT PLANNING
COMPLETE NATIONAL INFLATIONARY IMPACT STATEMENT (I.I.S.)
COMPLETE DRAFT PROGRAM REGULATIONS
ORGANIZE 1st SEB
ISSUE FINAL PROGRAM REGULATIONS
FILE FINAL PROGRAMMATIC EIS
ISSUE 1st SOLICITATION
1
NOTIFY GOVERNORS OF POTENTIALLY AFFECTED STATES
2
ETC
FILE DRAFT PROGRAMMATIC EIS WITH CEQ
ANTICIPATED ENACTMENT OF AUTHORIZING LEGISLATION
HEARINGS ON PROGRAMMATIC EIS DRAFT
BEGIN PUBLIC HEARINGS ON REGULATIONS
COMPLETE LONG RANGE PROGRAM PLAN
REPORT AND PROGRAM PLAN TO CONGRESS
1977
J
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RECEIVE FIRST INDUSTRY PROPOSALS
START PROPOSAL EVALUATIONS
COMPLETE HEARINGS ON 1st DEIS's
FILE FIRST SITE SPECIFIC FEIS AND IIA
ANNUAL UPDATE OF REPORT AND PLAN TO CONGRESS
RECEIVE FIRST IMPACT PLANNING SUPPORT REQUESTS
PUBLISH DRAFT OF FIRST SITE SPECIFIC DEIS's
AWARD FIRST COMMUNITY PLANNING ASSISTANCE GRANTS
RECEIVE & REVIEW ASSISTANCE PROPOSALS
SUBMIT FIRST PROJECT SELECTION FOR CONGRESSIONAL REVIEW
1
1st PROCUREMENT AWARDS
2
ETC.

TAB R

FACT SHEET

Relationship of the Commercial Demonstration Program to the Energy Independence Authority

The proposed Commercial Demonstration Program is intended to provide Federal assistance to construct and operate a limited number of synthetic fuel plants to provide economic, environmental and other information to enable industry and government to make appropriate decisions on the future role of synthetic fuels. The Energy Independence Authority on the other hand, would provide a wide range Federal financial assistance to help achieve energy independence goals. The EIA could provide a variety of kinds of financial assistance, including direct loans, to a large number of energy projects, many of which would not necessarily involve emerging technologies. The proposed synthetic fuels information program on the other hand, involves a set of financial tools to assist a specific group of emerging technologies (synthetic fuels).

Much of the planning work for Program initiation has already been completed by the Interagency Synthetic Fuels Task Force and implementation of the program could occur very soon after enactment of the proposed legislation (See TAB Q). It is expected that the EIA will involve lengthy Congressional consideration and would involve some start-up period, delaying early synthetic fuel commercial demonstration efforts. After the EIA has been formed the Synthetic Fuels Program will be transferred to EIA, possibly with construction of some projects well underway.

In the event that the EIA is not enacted, the Synthetic Fuels Commercial Demonstration Program would remain a part of ERDA. ERDA would then request additional authorizations for FY 1977 to fund the full information program.

In the 1979-1980 time frame a decision would be made on the need for a second phase of the program to achieve the President`s million barrel per day goal by 1985.

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